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4.0 Introduction

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Introduction

4.0

4.0.1 Background

Safety has been defined by the International Standards Organisation as ‘a state of freedom from unacceptable risks of personal harm’. This recognises that no activity is absolutely safe or free from risk. No *building* can be absolutely safe and some risk of harm to users may exist in every *building*. Building standards seek to limit risk to an acceptable level by identifying hazards in and around *buildings* that can be addressed through the Building (Scotland) Regulations.

Deaths and serious injury to people in and around *buildings* occur in significant numbers from accidents involving falls, collisions, entrapment, scalding, electrocution or malfunction of fittings. Designers need to consider all aspects of design carefully to minimise risks inherent in any building.

Safety - good practice

www.rospa.com

Not all issues relating to good practice are covered in this Technical Handbook. Publications by organisations including the Royal Society for Prevention of Accidents (RoSPA) may offer further information relevant to the safety of occupants of, and visitors to, buildings.

Accessibility

Buildings should be designed to consider safety and the welfare and convenience of *building* users. An inclusive environment is one within which everyone, regardless of age, disability or circumstance, can make use of safely, conveniently and without assistance to the best of their ability. *Buildings* that consider future flexibility of use also contribute to the creation of a more sustainable housing stock, simplifying alterations. This can allow people to remain longer in their home, through changing circumstances, with the minimum of disruption and inconvenience.

The guidance in this section, together with the guidance in section 3, Environment relating to accessibility, has been based around, and developed from, issues that are included in ‘Housing for Varying Needs’ and the Lifetime Homes concept developed by the Joseph Rowntree Foundation.

Access statements

Promoted by the implementation of the Disability Discrimination Act, which applies to most non-domestic buildings, many designers and developers are becoming familiar with the use of an access statement as a means of assisting in the delivery of more inclusive buildings. This records how access issues have been considered and developed from project inception, through all stages of development, through to the final use of a *building*.

Where design proposals vary from guidance within this Handbook or, in the case of a *conversion* where a standard is to be met as far as is *reasonably* practicable, relevant information extracted from a project access statement may assist in determining compliance.

Security

A dwelling that is safe and secure provides a positive contribution to the quality of life of its occupants and contributes to the delivery of a more sustainable community. Introducing basic measures to improve security can make unlawful entry into dwellings physically more difficult and ensure the safety and welfare of occupants.

4.0.2 Aims

The intention of this section is to give recommendations for the design of *buildings* that will ensure access and usability, reduce the risk of accident and unlawful entry. The standards within this section:

- ensure accessibility to and within *buildings* and that areas presenting risk through access are correctly guarded; and

- reduce the incidence of slips, trips and falls, particularly for those users most at risk; and
- ensure that electrical installations are safe in terms of the hazards likely to arise from defective installations, namely fire and loss of life or injury from electric shock or burns; and
- prevent the creation of dangerous obstructions, ensure that *glazing* can be cleaned and operated safely and to reduce the risk of injury caused by collision with glazing; and
- safely locate hot water and steam vent pipe outlets, and minimise the risk of explosion through malfunction of unvented hot water storage systems and prevent scalding by hot water from *sanitary* facilities; and
- ensure the appropriate location and *construction* of storage tanks for liquefied petroleum gas; and
- ensure that windows and doors vulnerable to unlawful entry are designed and installed to deter house breaking.

4.0.3 Latest changes

The following is a summary of the changes that have been introduced since 1 May 2009. Minor alterations and corrections have also been made. A full list of changes to the May 2010 edition of the Technical Handbooks is available on the Building Standards website.

- 4.13 Introduction of a new standard and supporting guidance on improving the physical security of dwellings.
- Updated guidance in respect of safety devices for unvented hot water systems.

4.0.4 Relevant legislation

Listed below are some pieces of legislation that may be relevant and/or helpful to those using the guidance in this particular section.

Electricity Safety, Quality & Continuity Regulations 2002

The Electricity Safety, Quality & Continuity Regulations 2002 define the duties of any party supplying electricity to premises with regard to matters such as supply, equipment, protection and provision of earthing.

The Gas Safety (Installation and Use) Regulations 1998

The Gas Safety (Installations and Use) Regulations 1998 require that any person who installs, services, maintains, removes, or repairs gas fittings should be competent. It covers not only materials, workmanship, safety precautions and testing of gas fittings but also the safe installation of all aspects of gas-fired combustion appliance installations.

4.0.5 Certification

Scottish Ministers can, under Section 7 of the Building (Scotland) Act 2003, approve schemes for the certification of design or construction for compliance with the mandatory functional standards. Such schemes are approved on the basis that the procedures adopted by the scheme will take account of the need to co-ordinate the work of various designers and specialist contractors. Individuals approved to provide certification services under the scheme are assessed to ensure that they have the qualifications, skills and experience required to certify compliance for the work covered by the scope of the scheme. Checking procedures adopted by Approved Certifiers will deliver design or installation reliability in accordance with legislation.

The certification of construction (electrical installations to BS 7671) scheme has been approved by Scottish Ministers to confirm compliance with relevant standards in section 4.

www.scotland.gov.uk/topics/built-environment/building/building-standards

4.1 Access to buildings

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- 4.1.7 Accessible entrances
- 4.1.8 Common entrances
- 4.1.9 Accessible thresholds
- 4.1.10 Alteration and extension

standard
4.1
mandatory

Every *building* must be designed and *constructed* in such a way that all occupants and visitors are provided with safe, convenient and unassisted means of access to the *building*.

Limitation:

There is no requirement to provide access for a wheelchair user to:

- (a) a *house*, between either the point of access to or from any car parking within the *curtilage* of a *building* and an entrance to the *house* where it is not *reasonably practicable* to do so; or
- (b) a common entrance of a *domestic building* not served by a lift, where there are no *dwellings* entered from a common area on the entrance *storey*.

4.1.0 Introduction

An inclusive approach to design should be taken to ensure that *buildings* are as accessible to as wide a range of people as possible. Solutions should be integral to a design rather than an afterthought added in order to meet duties under building standards or other legislation.

Inclusive Design

Inclusive design is not just relevant to buildings. It applies throughout any internal or external environment, where people go about everyday activities. It should be a continuous process, through all stages of the development of a *building* and involve potential users. Advice on this topic is available in the joint BSD/Scottish Executive Planning Division Planning Advice Note PAN 78: 'Inclusive Design' which promotes the merits of an inclusive approach to the design of the *built* environment.

Whilst the guidance to this standard reflects general good practice, certain issues remain outwith the scope of the building regulations. There are numerous publications offering additional guidance on accessibility and inclusive design, including those listed below:

- BS 8300: 2009 – 'Design of buildings and their approaches to meet the needs of disabled people – code of practice';
- Housing for Varying Needs, Parts 1 & 2 – Communities Scotland;
- Inclusive Mobility – Department of Transport, 2002;
- 'Guidance on the Use of Tactile Paving Surfaces', published jointly by The Scottish Office and the Department for the Environment, Transport and the Regions (DETR).

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirements of this standard in so far as is *reasonably practicable*, and in no case be worse than before the *conversion* (regulation 12, schedule 6).

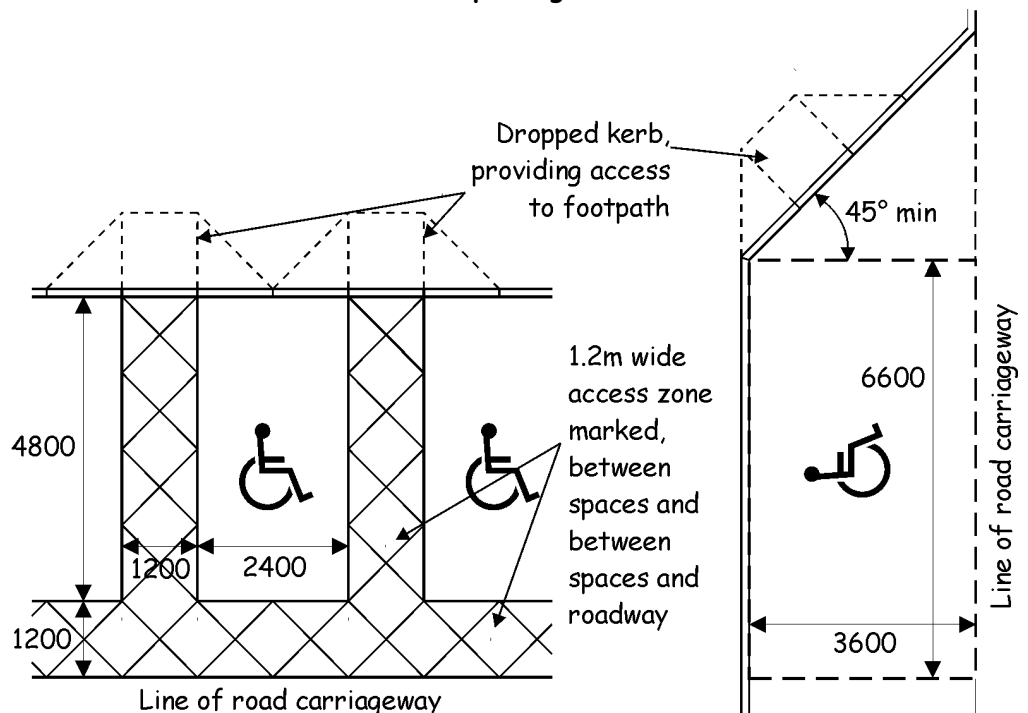
4.1.1 Accessible car parking to flats or maisonettes

The need for car parking serving a *domestic building* will commonly be determined by a developer and may also be a condition of planning permission. Where car parking is provided within the curtilage of a *building* containing *flats* or maisonettes, it should include accessible spaces.

A proportion of car parking spaces should be designed to be accessible to a person with mobility impairment, including a wheelchair user, and designated for use as such. These parking spaces should be:

- provided at a ratio of at least 1 per 20 parking spaces, or part thereof; and
- located on a *road* surface that is level (with a gradient of not more than 1 in 50); and
- not more than 45 m from a common entrance; and
- clearly marked with the international symbol of access; and
- provided with a dropped kerb access to an accessible route; and
- where perpendicular or at an angle to a *road*, at least 4.8 m long x 2.4 m wide, outwith which a delineated access zone at least 1.2 m wide to each long side and between the end of the bay and any *road* is shown; or
- where parallel to a *road*, at least 6.6 m long by 3.6 m wide, as shown below.

Off- and on-street accessible car parking



4.1.2 Car parking within the curtilage of a dwelling

Where car parking is provided within the *curtilage* of a dwelling, a person should be able to alight from a vehicle directly onto the firm surface of an accessible route to the dwelling.

Where a driveway or car parking space forms part of an accessible route to a dwelling, it should be at least 3.3 m wide to allow a 900 mm wide pedestrian route past a parked car. That portion of the driveway surface should be in accordance with the recommendations in clause 4.1.4.

4.1.3 Accessible routes

Regardless of how they arrive within the *curtilage* of a building, a person should then be able to travel conveniently and without assistance to an entrance of a building. Routes to a *building* that are too steep, too narrow or poorly surfaced, or that contain steps or other obstructions, will make access difficult or impossible for many people. To prevent this, a route to an entrance should be provided that is accessible to everyone.

An accessible route should contain no barriers, such as kerbs, steps or similar obstructions that may restrict access. Street furniture can present a hazard, particularly to a wheelchair user or a person with a visual impairment and should be located outwith the width of an accessible route. Use of low-level bollards or chain-linked posts, for example, can be particularly hazardous.

There should be an accessible route to the accessible entrance of a single *dwelling* from:

- a road; and
- any car parking within the *curtilage* of the dwelling.

There should be an accessible route to the common entrance of a *building* containing *flats* or *maisonettes* and to an accessible entrance of any *dwelling* not reached through a common entrance, from:

- a road; and
- any accessible car parking (see clause 4.1.1) within the *curtilage* of the building.

Gradient of accessible route

As steeper gradients are more difficult to negotiate, level or gently sloping routes should be used wherever possible, in preference to ramps. An accessible route should be:

- level, which for the purpose of this guidance is a gradient of not more than 1 in 50; or
- gently sloping, which for the purpose of this guidance is a gradient of more than 1 in 50 and not more than 1 in 20; or
- ramped, with a gradient of more than 1 in 20 and not more than 1 in 12.

The cross-fall on any part of an accessible route should not exceed 1 in 40.

Gently sloping gradients

Gently sloping gradients should be provided with level rest points of not less than 1.5 m in length, at intervals dependent on the gradient of the sloping surface. This should follow the same relationship given for ramp flights, e.g. up to 20 m apart for a slope of 1 in 30, 30 m for a slope of 1 in 40 and so on.

Recommendations for ramps are provided in the guidance to standard 4.3.

Complimentary steps

Ramps are not necessarily safe or convenient for an ambulant person with mobility impairment, and can be more difficult and dangerous to negotiate than steps. Therefore, on a route serving more than 1 *dwelling*, any ramped access having a rise of more than 300 mm should be complemented by an alternate, stepped means of access.

Stepped access to a single *house*

There may be stepped access to a route serving a single *house* where it is not *reasonably practicable* to construct an accessible route, such as on a steeply sloping site. As a guideline, if a ramp to an accessible entrance can be formed within the *curtilage* of the *dwelling* with one change in direction between the bottom of the ramp and the top landing, access should be considered *reasonably practicable*.

Where an accessible route cannot be provided from a road, it may still be practicable to *construct* an accessible route by providing a car parking space within the *curtilage* of the dwelling. It is only where it is not *reasonably practicable* to *construct* an accessible route from either a *road* or from car parking within the *curtilage* of the *dwelling* that a stepped access solution may be proposed.

4.1.4 Surfaces to accessible routes

For safety and convenience in use, the surface of an accessible route should be firm, uniform and of a material and finish that will permit ease in manoeuvring. It should provide a degree of traction that will minimise the possibility of slipping. This should take into account both anticipated use and environmental conditions.

The surface of an accessible route, whether composed of modular paving units, formless materials such as tarmac, or another durable material, should have a profile that will not offer a trip hazard or result in standing water. It should be installed in accordance with a code of practice relevant to the material, where such exists.

Surface elements such as drainage gratings and manhole covers should be of a type that will not create a trip or entrapment hazard. Uneven surfaces, such as cobbles, or loose-laid materials, such as gravel, will present difficulties to many people and should not be used.

Tactile paving

At a location where the footpath is level with a *road* surface, such as at a dropped kerb, tactile paving should be used to warn a person with a visual impairment of the presence of a vehicular route. This need not apply to a route within the *curtilage* of a single *dwelling*. Information on use of tactile paving on footpaths is given in 'Guidance on the Use of Tactile Paving Surfaces'.

4.1.5 Length of accessible routes

The longer a pedestrian route, the greater difficulty it can present to many people. Therefore, in addition to minimising gradients where possible, as recommended in clause 4.1.3, the length of an accessible route to an accessible entrance of a *building* should be limited to 45 m.

4.1.6 Width of accessible routes

The width of a pedestrian route to a *building* should reflect how it will be used. For example, most public footpaths are at least 1.8 m wide, which allows two-way traffic under most circumstances.

The clear and unobstructed surface width of an accessible route should generally be at least 1.8 m, unless:

- giving access to not more than 10 dwellings, where the minimum surface width may be not less than 1.2 m. This will accommodate any person where traffic is in a single direction of travel. To allow for passing, localised widening of any route less than 1.8 m wide to at least 1.8 m should be made at any junction and change of direction and, where the whole length of the route is not visible, also at not more than 10 m intervals along the route; or
- giving access to a single dwelling, where effective width may be not less than 900 mm, recognising reduced levels of traffic.

On an accessible route serving more than one dwelling, a level footpath of not less than 1.0 m in width should be maintained to the rear of the slope of any dropped kerb.

Any gate across an accessible route should offer a clear opening width of at least 850 mm.

4.1.7 Accessible entrances

Each common entrance to a *domestic building* and at least one entrance to a *dwelling* should be an accessible, designed to present as little restriction to passage as possible.

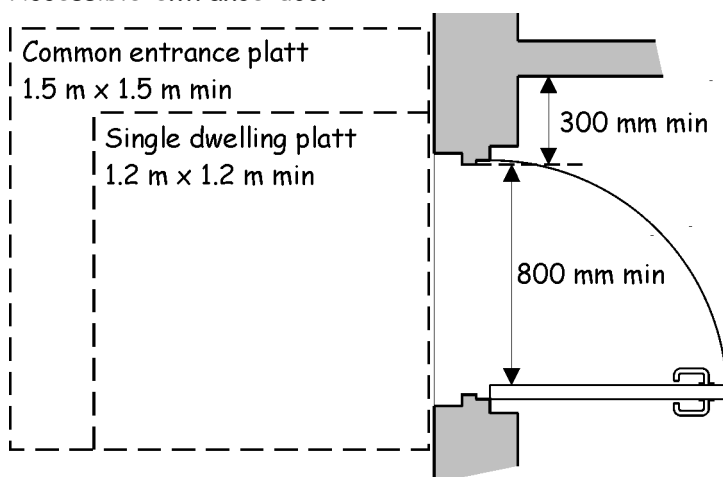
Whilst an accessible entrance to a *house* is commonly the front or main entrance, an alternate entrance may be designated as the accessible entrance where this provides a more convenient or practical route into the dwelling.

An accessible entrance to a *building* should:

- have an unobstructed entrance platt of at least 1.2 m by 1.2 m, with a crossfall of not more than 1 in 50, if required to prevent standing water; and
- have a means of automatic illumination above or adjacent to the door; and
- have an accessible threshold; and
- have a door leaf giving a clear opening width of at least 800 mm in accordance with the diagram below; and
- if fitted with a door closing device, be operable with an opening force of not more than 30 N (for first 30° of opening) and 22.5 N (for remainder of swing) when measured at the leading edge of any door leaf; and
- if not a powered door, have an unobstructed space to the opening face of the door, next to the leading edge, of at least 300 mm.

However where there is not an accessible route to a single house, the guidance in subclauses a and c above need not be followed.

Accessible entrance door



Clear opening width

The projection of ironmongery which extends across the width of a door leaf, such as an emergency push bar for escape or a horizontal grab rail, should be subtracted when calculating the clear opening width.

4.1.8 Common entrances

In addition to the recommendations in clause 4.1.7, a common entrance to a *domestic building* should have:

- an unobstructed entrance platt, measuring at least 1.5 m by 1.5 m, with a crossfall of not more than 1 in 50 if required to prevent standing water; and
- a canopy, recessed entrance or similar means of protecting people entering the *building* from exposure to the elements; and
- a *glazed* vision panel, as described below; and
- a door entry system.

Weather protection

The form that weather protection should take will vary with location and exposure of the *building*. However an example of minimum provision might be a canopy or recess, 750 mm deep, across the width of the entrance platt, with an underside not more than 2.3 m above entrance level. It is recognised that there are circumstances where provision of weather protection may not be practicable or may be constrained by other permissions.

Glazed vision panels

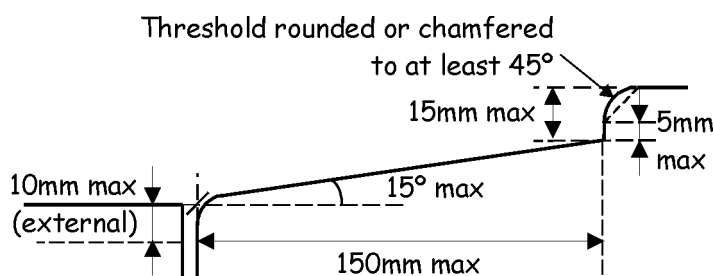
To assist in preventing collisions, a clear *glazed* vision panel or panels to a door should give a zone of visibility from a height of not more than 500 mm to at least 1.5 m above finished floor level. This may be interrupted by a solid element between 800 mm and 1.15 m above floor level. A vision panel is not needed to a powered door controlled by automatic sensors or where adjacent *glazing* offers an equivalent clear view to the other side of a door.

Guidance relevant to specific door types such as revolving doors or powered doors is given in the non-domestic Technical Handbook.

4.1.9 Accessible thresholds

To be accessible, a door should not present unnecessary barriers to use, such as a step or raised profile at a threshold that might present difficulties to a wheelchair user or be an entrapment or trip hazard to an ambulant person, whether or not using a walking aid.

Generic Threshold Profile



An accessible threshold should meet the following criteria:

- thresholds should be designed to prevent the ingress of rain. Details in the DETR publication 'Accessible Thresholds in New Housing' gives guidance on how this might be achieved;
- externally, the surface of the platt should be not more than 10 mm below the leading edge of any sill, with any exposed edge chamfered or rounded;
- an external sill or internal transition unit should be at an angle of not more than 15° from the horizontal and, if sloping, be not more than 150 mm in length;
- the threshold should either be level or of a height and form that will neither

impede unassisted access by a wheelchair user nor create a trip hazard. A threshold piece should have a height of not more than 15 mm, with any vertical element of more than 5 mm height being pencil-rounded or chamfered to an angle of not more than 45° from the horizontal;

- if the finished internal floor level is more than 15 mm below the top of the threshold, an internal transition unit, of not more than 15° to the horizontal, finishing not more than 5 mm above the internal floor surface may be used, in accordance with the guidance above. In new buildings, this should normally only be needed to allow flexibility in subsequent fitting of differing thickness of floor coverings.

4.1.10 Alteration and extension

Where a *dwelling* is altered or extended, this *work* should not adversely affect an existing accessible entrance.

Where a *dwelling* does not have an accessible entrance, one need not be provided to the existing *dwelling*, or to the extension, as this will not result in the *building* failing to meet the standard to a greater degree.

Where an accessible entrance exists, any *works* should ensure that the existing entrance remains accessible. If this is not possible, a new accessible entrance should be provided elsewhere into the dwelling. Such an entrance should also maintain accessibility within the dwelling, as set out in guidance to standard 4.2.

4.2 Access within buildings

- 4.2 Functional standard
- 4.2.0 Introduction
- 4.2.1 Horizontal circulation in common areas of domestic buildings
- 4.2.2 Floor surfaces in common areas of domestic buildings
- 4.2.3 Lobbies in common areas of domestic buildings
- 4.2.4 Doors within common areas of a domestic building
- 4.2.5 Vertical circulation in common areas of domestic buildings
- 4.2.6 Accessibility within a storey of a dwelling
- 4.2.7 Access between storeys in a dwelling
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- 4.2.9 Split level storeys
- 4.2.10 Dwellings with limited entrance storey accommodation
- 4.2.11 Alterations and extensions

standard
4.2
mandatory

Every **building** must be designed and **constructed** in such a way that:

- (a) in non-domestic **buildings**, safe, unassisted and convenient means of access is provided throughout the **building**;
- (b) in **residential buildings**, a proportion of the **rooms** intended to be used as bedrooms must be accessible to a wheelchair user;
- (c) in **domestic buildings**, safe and convenient means of access is provided within common areas and to each **dwelling**;
- (d) in **dwellings**, safe and convenient means of access is provided throughout the **dwelling**; and
- (e) in **dwellings**, unassisted means of access is provided to, and throughout, at least one level.

Limitation:

There is no requirement to provide access for a wheelchair user:

- (a) in a non-domestic **building** not served by a lift, to a **room**, intended to be used as a bedroom, that is not on an entrance **storey**; or
- (b) in a **domestic building** not served by a lift, within common areas and to each **dwelling**, other than on an entrance **storey**.

4.2.0 Introduction

Circulation areas within a **building** should allow occupants to move around freely and without difficulty, to the best of their ability. Lack of space can make movement around a **building** difficult for many people and hamper activities such as carrying or moving large items.

The design process should consider how the **building** can be used by as wide a range of people as possible, including use by a person in a wheelchair, though it is recognised that this may not be to the optimum standard that can be achieved within purpose-built dwellings.

Improvement to circulation within **dwellings** under this standard, together with the provision, on one level, of an enhanced **apartment**, and kitchen (standard 3.11) and accessible **sanitary accommodation** (standard 3.12) will assist in creating more sustainable homes.

Whilst the guidance to this standard reflects general good practice, certain issues remain outwith the scope of the building regulations. There are numerous publications offering additional guidance on accessibility and inclusive design, including those listed below:

- BS 8300: 2009 – ‘Design of buildings and their approaches to meet the needs of disabled people – code of practice’;
- Housing for Varying Needs, Parts 1 & 2 – Communities Scotland.

Conversions

In the case of conversions, as specified in regulation 4, the **building** as **converted** shall meet the requirements of this standard in so far as is **reasonably** practicable, and in no case be worse than before the **conversion** (regulation 12, schedule 6).

4.2.1 Horizontal circulation in common areas of domestic buildings

The common areas of *domestic buildings* containing *flats* or maisonettes, though secured against unauthorised entry, remain in effect a public or shared area. As an enclosed space, it is important that provisions made on the approach to the *building* are maintained within these areas.

There should be level or ramped access within the common areas of a *domestic building*:

- *from* a common entrance to the entrance of any *dwelling* or communal facilities on the entrance *storey* and to any passenger lift; and
- where a passenger lift is installed, from the passenger lift to any *dwelling* and to any communal facilities on an upper storey.

Circulation routes within common areas should allow safe and convenient passage and provide space for manoeuvring at junctions and when passing through doorways. All corridors therefore should have a minimum width of at least 1.2 m.

To allow manoeuvring space for both people and furniture, routes should be widened locally, at changes of direction, junctions and at the landing of any lift, to accommodate, clear of any obstruction, a 1.5 m turning circle.

Obstructions

Other than on a wall opposite a doorway, or in the areas noted above, an obstruction such as a radiator may project up to 100 mm, reducing corridor width to not less than 1.1 m, over a maximum length of 900 mm.

Gently sloping surfaces

Within a building, unidentified gradients may disorient *building* users and the need for gently sloping surfaces on circulation routes should be considered carefully before use. Level rest points on gently sloping routes should be provided as recommended in clause 4.1.3. Where not extending across the full width of a *room* or corridor, guarding should be provided to any exposed edge of such an area as for a ramp *flight*, as noted in the guidance to standard 4.4.

4.2.2 Floor surfaces in common areas of domestic buildings

Floor surfaces within common areas should be uniform, permit ease in manoeuvring and be of a material and finish that, when clean and dry, will provide a level of traction that will minimise the possibility of slipping.

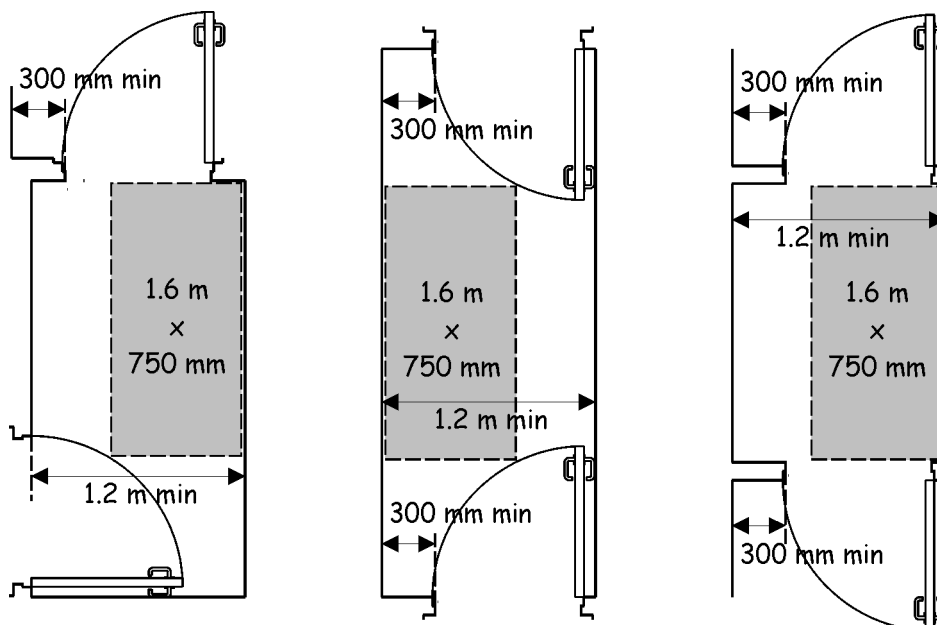
Where there is a change in the characteristics of materials on a circulation route, such as from a tile to carpet finish, transition should be level and, where *reasonably* practicable, differing surfaces should contrast visually to identify the change in material and reduce the potential for trips.

4.2.3 Lobbies in common areas of domestic buildings

Use of a lobby can reduce the effect of external conditions on the interior of a *building* and may also contribute to fire safety. However where two sets of doors are in close proximity, this can present a hazard and a potential barrier to access.

Any lobby at the entrance to or within the common areas of a *domestic building* should allow a person to pass through whilst remaining clear of the swing of doors. A rectangular area, outwith any door swing, of at least 1.6 m long by 750 mm wide will permit safe passage of, for example, a person in a wheelchair and a companion.

Accessible lobby dimensions



Where either door can be secured by a locking device, a lobby should be not less than 1.5 m wide. This will permit a wheelchair or pram to be turned around should passage be denied.

4.2.4 Doors within common areas of a domestic building

Doors within the common areas of a domestic *building* should present as little restriction to passage as practicable and be *constructed* in a manner that does not present a hazard or a potential barrier to access.

A door located within the common areas of a *domestic building* should:

- if fitted with a threshold, have an accessible threshold; and
- have a door leaf giving a clear opening width in accordance with the table below; and
- where across a circulation route or giving access to communal facilities, have a *glazed* vision panel in any opening leaf, as described in clause 4.1.8; and
- have a door leaf that, if fitted with a door closing device, be operable with an opening force of not more than 30 N (for first 30° of opening) and 22.5 N (for remainder of swing) when measured at the leading edge of the leaf; and
- if not a powered door, have an unobstructed space to the opening face of the door, next to the leading edge, of at least 300 mm.

Width of doors

Minimum corridor width at door (mm)	Minimum clear opening width (mm) [1]
1500	800
1200	825 [2]
900 [3]	850 [2]

Notes:

1. The projection of any ironmongery that extends across the width of a door leaf, such as an emergency push bar to a fire exit or horizontal grab rail, should be subtracted when calculating the clear opening width.
2. The clear opening width may be 800 mm where a door is approached head-on.
3. A corridor width of less than 1.2 m should not be present within new *buildings* but may be found within some existing *buildings*.

A door should not open onto a circulation route in a manner that creates an obstruction, other than a door to a cupboard or duct enclosure that is normally locked in a closed position.

4.2.5 Vertical circulation in common areas of domestic buildings

Stairs in common areas should be designed to be accessible to a person with reduced mobility, as described in guidance to standard 4.3. There should be an accessible stair between each level of a *building*.

Level access, or access by a stair or ramp device should be provided to any storey, or part of a *storey*. However it is recognised that it may not be necessary or, in some cases, *reasonably practicable* to provide full access to all parts of a *building*. Consequently, such access need not be provided to any *storey*, or part of a *storey*:

- containing only fixed plant or machinery, the only normal visits to which are intermittent, for inspection or maintenance purposes; or
- where access is restricted to suitably trained persons for health and safety reasons, such as to walkways giving access only to machinery or to catwalks and working platforms, reached by industrial ladder.

Passenger lifts

Installation of a passenger lift will allow all *dwelling*s on upper *storeys* to be reached from a common entrance level. However it is recognised that it may not always be *reasonably practicable* to provide lift access within all *domestic* buildings.

Therefore, a *building* containing *flats* or *maisonettes* may be constructed without a passenger lift where not more than 4 *storeys* in height and where there is no *dwelling* with a principal living level at more than 10 m above either a common entrance level or the level of the lowest storey.

In any *building* above this height, or where there are communal facilities on a level other than a common entrance level, there should be a means of unassisted access. This should serve each level of the *building* that contains a common entrance, an entrance to a *dwelling* or communal facilities. Unassisted access between *storeys* should be by passenger lift, with the installation meeting the recommendations of BS EN 81-70: 2003.

Any passenger lift should be designed and installed to include the following:

- a. a clear landing at least 1.5 m x 1.5 m in front of any lift entrance door; and
- b. automatic lift door(s), with a clear opening width of at least 800 mm, fitted with sensors that will prevent injury from contact with closing doors; and
- c. a lift car at least 1.1 m wide by 1.4 m deep; and
- d. within the overall dimensions of the lift car, a horizontal handrail, of a size and section that is easily gripped, 900 mm above the floor on each wall not containing a door; and
- e. within a lift car not offering through passage, a mirror on the wall facing the doors, above handrail height, to assist a wheelchair user if reversing out; and
- f. within the lift car, tactile *storey* selector buttons and, in a lift serving more than 2 storeys, visual and voice indicators of the *storey* reached; and
- g. controls on each level served, between 900 mm and 1.1 m above the landing, and within the lift car on a side wall between 900 mm and 1.1 m above the car floor and at least 400 mm from any corner; and
- h. on the landing of each level served, tactile call buttons and visual and tactile indication of the *storey* level; and
- i. lift doors, handrails and controls that contrast visually with surrounding surfaces; and
- j. a signalling system which gives notification that the lift is answering a landing call; and
- k. a system which permits adjustment of the dwell time after which the lift doors close, once fully opened, to suit the level of use; and
- l. a means of two way communication, operable by a person with a hearing impairment, that allows contact with the lift if an alarm is activated, together with visual indicators that an alarm has been sounded and received.

4.2.6 Accessibility within a storey of a dwelling

To ensure facilities within a *dwelling* can be reached and used by occupants, each *storey* within a *dwelling* should be designed to be accessible. There should be safe and convenient access to and throughout each *storey* other than to a level which comprises solely of storage and/or such accommodation as may be accessed via a 600 mm wide stair.

Each accessible level or *storey* within a *dwelling* should have:

- a. corridors with an unobstructed width of at least 900 mm wide. This may be reduced to 800 mm over a maximum length of 900 mm by permanent obstructions, such as radiators, except on a wall opposite a doorway; and
- b. corridors that are large enough to accommodate an unobstructed area of 1.1 m by 800 mm which, where a door being used opens into the corridor, is oriented in the direction of entry and is clear of the door swing; and
- c. doors with a minimum clear opening width in accordance with the following table to each room, including any apartment, *kitchen* or *sanitary* facility.

Width of doors

Minimum corridor width at door (mm)	Minimum clear opening width (mm)
1050	775
900	800 [1]

Notes:

1. The opening width may reduce to 775 mm where a door is approached head-on.

Principal living level

In addition, there should be unassisted access to the basic accommodation needed in any dwelling. The principal living level of a dwelling, normally also the entrance storey, should contain at least one enhanced *apartment* (see clause 3.11.2), a *kitchen* (see clause 3.11.3) and accessible *sanitary accommodation* (see clause 3.12.3). This accommodation should be either on one level or, if on different levels within a storey, accessible without a stepped change of level.

4.2.7 Access between storeys in a dwelling

Where a *dwelling* has accommodation on more than one level, the levels containing accommodation should be connected by a stair or ramp within the *dwelling* following the guidance given under standard 4.3.

However the guidance under standard 4.3 need not be applied to a fixed means of access leading only to a *storey* or level containing storage, though access to such a level must still meet standard 4.3 and offer safe passage.

4.2.8 Unassisted access between storeys in a dwelling

Not everyone can use stairs unassisted. This may mean that the upper levels of a *dwelling* are not accessible to some occupants. Guidance elsewhere considers situations where occupants, incapacitated for a short period of time, might live within one storey. However this is not generally appropriate for longer term illness or infirmity, where a more permanent, inclusive, solution is required.

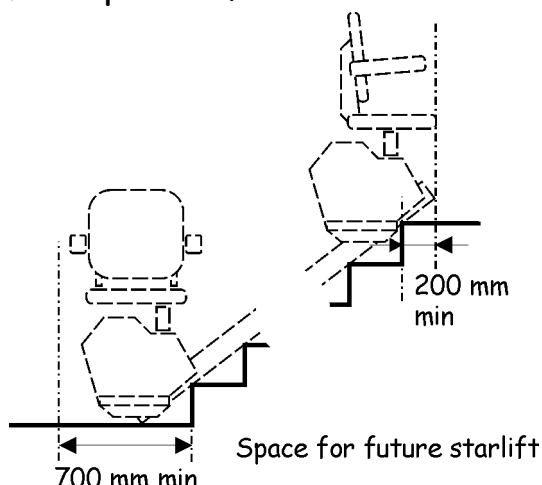
Provision should be made for future installation of a means of unassisted access, both within a *storey* and between storeys.

Future installation
of a stairlift

To allow for future installation of a stair lift, any stair giving access to a principal living level or to accommodation greater than may be accessed via a 600 mm wide stair (see clause 4.3.3) should:

- have an area of wall not less than 700 mm in length, or an equivalent space, adjacent to the bottom riser of a stair and clear of any obstruction, fitting or doorway, to allow for parking of a stairlift at rest position. This space should be not less than 400 mm in depth; and
- have a similar area of not less than 200 mm in length, on the same side of the flight, at landing level adjacent to the top nosing of the stair, to assist in transfer at the upper level, allowing for projection of a stair lift track.

Future provision for unassisted access



4.2.9 Split level storeys

Any change of level within a *storey* should not compromise access to facilities within the principal living level of a dwelling.

A *storey* may be split level provided a stepped change of level does not divide the accommodation forming the principal living level of a *dwelling* (see clause 4.2.6). In addition, if a stepped change of level is proposed on an entrance *storey* containing the principal living level, the route from the accessible entrance of the *dwelling* to the accommodation forming the principal living level should be without a stepped change of level.

4.2.10 Dwellings with limited entrance storey accommodation

Where a dwelling, such as a townhouse or upper villa flat, contains no, or only limited, accommodation on the entrance storey, this can make access to the basic facilities within the *dwelling* more difficult for many people.

Where the entrance *storey* of a *dwelling* is not also the principal living level, the first *storey* above or below entrance *storey* which contains an enhanced *apartment*, *kitchen* and accessible *sanitary accommodation* is considered to be the principal living level.

Where there is not level or ramped access from the accessible entrance of a *dwelling* to the principal living level, the principal living level should be made accessible to as wide a range of occupants as possible and, accordingly:

- a stair, from an accessible entrance to the principal living level, should follow the guidance on rise, going and pitch for 'any other stair' given in clause 4.3.2; and
- provision for installation of a stairlift should be made as described in clause 4.2.8; and
- entrance level accommodation should contain an area of at least 800 mm wide by 1.1 m long that would permit storage of a wheelchair or pram. This should be outwith the minimum corridor width noted in clause 4.2.6 and clear of any door way, door swing, stair landing or space identified for a future stairlift installation.

Where the entrance level of such a *dwelling* contains 2 or more apartments, there should also be an accessible *toilet* on the entrance level in accordance with the guidance in clause 3.12.3. This is in addition to accessible *sanitary facilities* on the principal living level. There should be level or ramped access from the accessible entrance of the dwelling to this accessible *toilet* and at least 1 of the *apartments* on the entrance storey.

4.2.11 Alterations and extensions

Where accommodation within a *dwelling* meets the recommendations in clauses 4.2.6 to 4.2.10, any *works* to the *dwelling* should maintain compliance.

Altering an existing
dwelling

Where alteration of a *building* includes *work* to, or provision of, a new circulation area, guidance should be followed as far as is *reasonably* practicable. This recognises that physical constraints within an existing *building* may mean compliance with space provision is not always possible.

Consequential
alterations

Where existing accommodation does not meet the provisions set out in guidance, it need not be altered to comply except for consequential work, needed to ensure compliance with another standard. An example would be where an accessible entrance has been relocated and alterations are required to circulation space to maintain accessibility within the building.

4.3 Stairs and ramps

- 4.3 Functional standard
- 4.3.0 Introduction
- 4.3.1 Measurement for stairs
- 4.3.2 Rise, going, tread and pitch of stairs
- 4.3.3 Width of stair flights and landings
- 4.3.4 Number of rises in a flight
- 4.3.5 Risers and treads
- 4.3.6 Stair landings
- 4.3.7 Warning surfaces to landings of external steps
- 4.3.8 Stair landings serving outward opening fully glazed doors
- 4.3.9 Stair flights consisting of both straight and tapered treads
- 4.3.10 Stair flights consisting wholly of tapered treads
- 4.3.11 Pedestrian ramps
- 4.3.12 Width of ramps flights
- 4.3.13 Ramp landings
- 4.3.14 Handrails to stairs and ramps
- 4.3.15 Height of handrails
- 4.3.16 Headroom on stairs and ramps
- 4.3.17 Industrial stairs and fixed ladders

standard

4.3

mandatory

Every *building* must be designed and *constructed* in such a way that every level can be reached safely by stairs or ramps.

4.3.0 Introduction

Half of all accidents involving falls within and around *buildings* occur on stairways, with young children and elderly people being particularly at risk. This risk can be greatly reduced by ensuring that any change in level incorporates basic precautions to guard against accident and falls.

Stairs and ramps should be *constructed* to be within limits recognised as offering safe and convenient passage and designed so that any person who is likely to use them can do so comfortably and safely, with the minimum amount of difficulty. Design should also address the issue of appropriate guarding, where a level change is made, and seek to eliminate any possible trip hazards.

Explanation of terms

The following terms are explained to provide clarity to their meaning in the Technical Handbooks.

Private stair means a stair wholly within a *dwelling*. It may also apply to any stair within the *curtilage* of a single *dwelling*, which is not accessible to the public. This might include, for example, a stair from a *dwelling* to a private garden, or a stair providing access to or within a domestic garage. It should not, however include any external stair that forms a part of an accessible route to the *dwelling*.

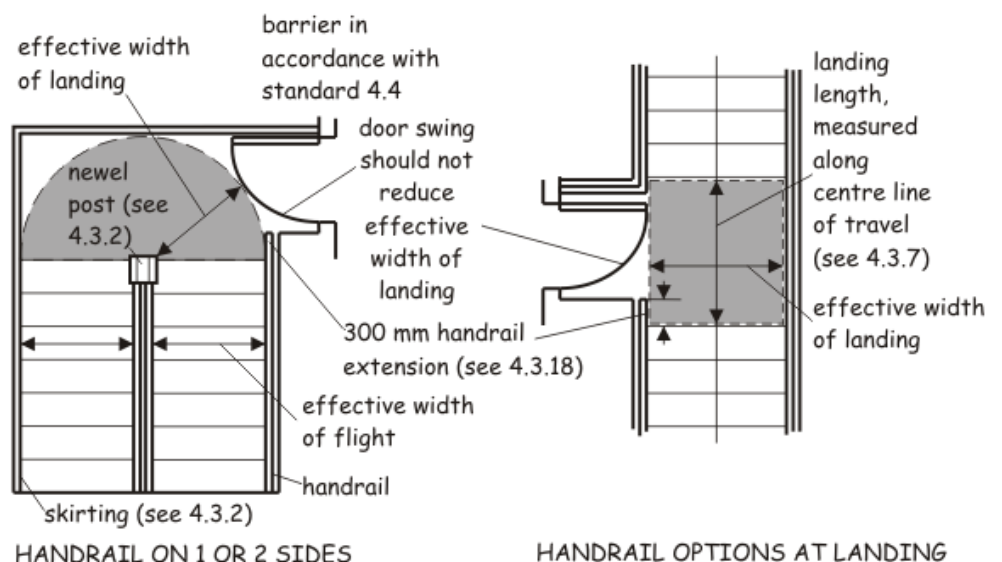
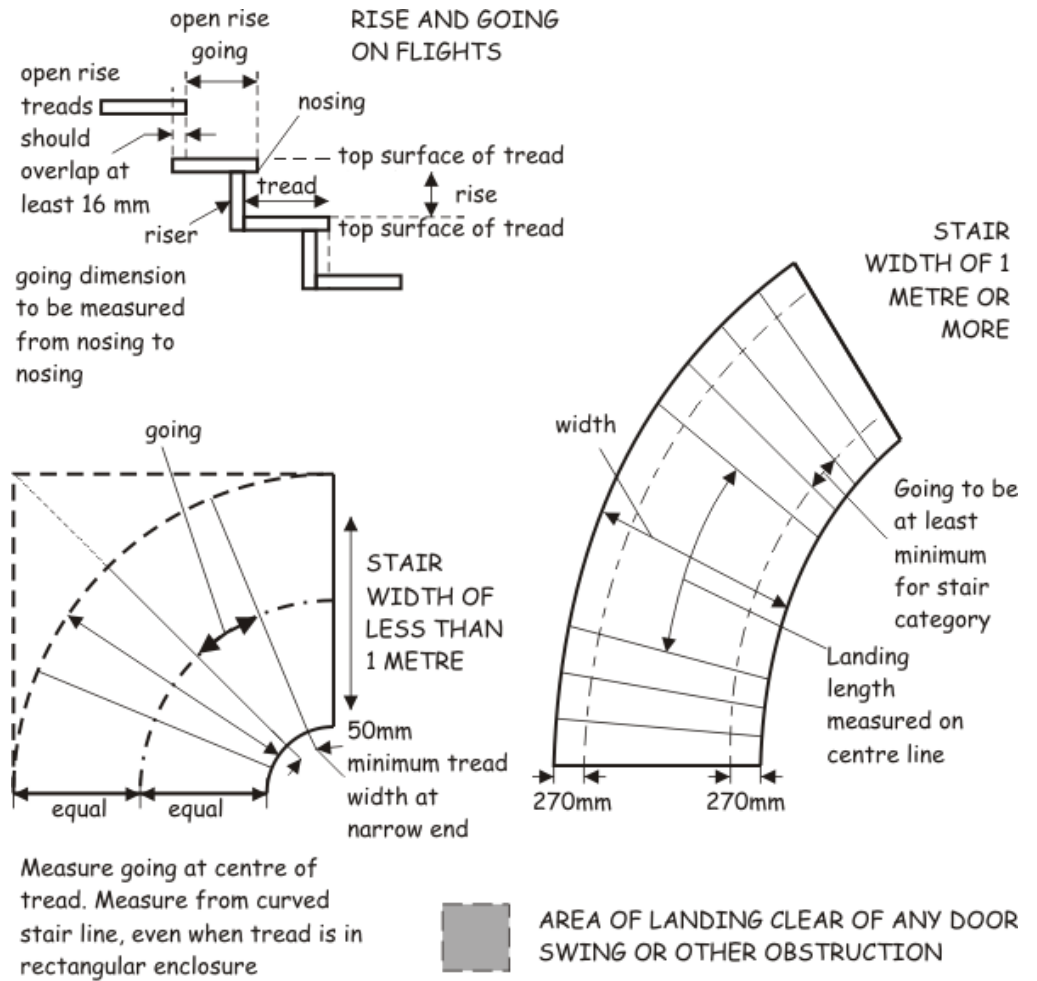
Tapered tread means a stair tread in which the nosing is not parallel to the nosing of the tread or landing next above.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirements of this standard in so far as is *reasonably* practicable, and in no case be worse than before the *conversion* (regulation 12, schedule 6).

4.3.1 Measurement for stairs

Measurement for stairs



4.3.2 Rise, going, tread and pitch of stairs

The geometry of a stair *flight* can have a significant effect on the ability of people to use a stair safely and conveniently and limits should be placed on the rise and going of a stair, and steepness of pitch.

The pitch of a *private stair flight* may be steeper than that of a public *flight* (any other stair) in recognition that users, as occupants, will be more familiar with the stair through frequent use.

To provide safe and convenient access, the rise, going, tread and pitch of a *flight* in a stair should be in accordance with the following table:

Stair geometry – private stair

Minimum rise (mm)	Maximum rise (mm)	Minimum going (mm)	Tread	Maximum pitch
100	220	225	not less than going	42°

Stair geometry – Any other stair, including to a domestic building or within the common area of a building containing flats or maisonettes

Minimum rise (mm)	Maximum rise (mm)	Minimum going (mm)	Tread	Maximum pitch
100	170	250	not less than going	34°

Notes:

1. All rises in a *flight* should be of uniform height;
2. In a straight *flight*, or in a part of a *flight* that is straight, measurement should be uniform along the centreline of the *flight*;
3. Where a *flight* consists partly of straight and partly of tapered treads, the going of the tapered treads should be uniform and should not be less than the going of the straight treads;
4. The going measured at the narrow end of a tapered tread should be at least 50 mm (see diagram to clause 4.3.1);
5. The aggregate of the going and twice the rise should be at least 550 mm and not more than 700 mm. For example, stairs provided with the minimum going of 250 mm would result in rises of at least 150 mm;
6. The maximum rise and minimum going on a *private stair* should not be used together as this will result in a pitch greater than the recommended maximum;
7. Clause 4.2.10 should be referred to for exceptions where a *private stair* should meet the above recommendations for 'any other stair'.

The most comfortable combination of rise and going varies between individuals but in general, a going in excess of a minimum value, resulting in a figure in the upper end of the range in note 5, above, will increase both safety and amenity.

4.3.3 Width of stair flights and landings

The clear, or effective, width of a stair should allow users to move up and down unhindered and, on stairs giving access to a *dwelling* or *domestic* building, permit people to pass on a flight.

The effective width should be measured between handrails or, where there is no handrail present, between any walls or protective barriers. It should be clear of obstructions, as described in the diagram to clause 4.3.1. The effective width of a stair should be in accordance with the recommendations of the following table:

Effective widths of flights and landings

Private Stair	Any other stair
900 mm [1], such as from one <i>storey</i> to another or connecting levels within a <i>storey</i> ; or	1.0 m generally, such as to an external <i>flight</i> to a <i>domestic building</i> or a common access within a <i>building</i> containing <i>flats</i> or <i>maisonnettes</i> ; or
600 mm where serving only <i>sanitary accommodation</i> and/or one room, other than accessible <i>sanitary accommodation</i> , a <i>kitchen</i> or an enhanced apartment.	900 mm to an external <i>flight</i> serving a single <i>dwelling</i> , to which the public have access.

Notes:

1. The effective width of a *private stair* may be 800 mm where a continuous handrail is fitted to both sides of a *flight*.

The projection of any stringer or newel post into this width should be not more than 30 mm.

Stair lifts

A stair lift may be fitted to a *private stair* and may project into the effective width of the stair. However in such cases, at least 1 handrail should be present as described in clause 4.3.14 and, when not in use, the installation should:

- a. permit safe passage on the stair *flight* and any landing; and
- b. not obstruct the normal use of any door, doorway or circulation space.

Clause 4.2.8 gives guidance on the space to be provided adjacent to a stair *flight* to accommodate a future stair lift installation.

4.3.4 Number of rises in a flight

The act of climbing stairs can be tiring to many people. Whilst landings can provide a safe resting point, the *flight* itself is not intended to do so. The maximum number of rises between landings should therefore be limited.

Generally, a *flight* should have not more than 16 rises.

Below a minimum number of steps, it becomes difficult to signal a change of level, which can contribute significantly to a trip hazard.

Generally, a *flight* should have at least 3 rises.

However people tend to take greater care at certain locations, such as at an external door, and a single step or 2 steps may be appropriate under certain circumstances. There may be less than 3 rises:

- a. other than at an accessible entrance, between an external door of a *building* and the ground or a balcony, conservatory, *porch* or private garage; or
- b. wholly within an *apartment* other than where affecting provisions within an enhanced apartment (see clause 3.11.2); or
- c. wholly within *sanitary accommodation*, other than accessible *sanitary accommodation* (see clause 3.12.3); or
- d. between a landing and an adjoining level where the route of travel from the adjoining level to the next *flight* changes direction through 90° (i.e. on a quarter landing as the first step).

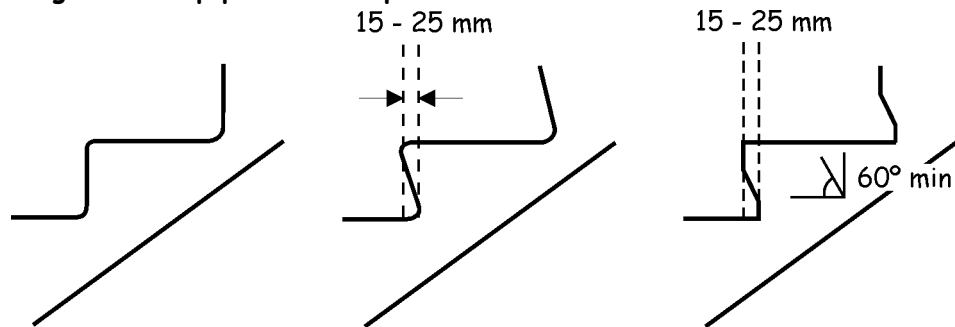
4.3.5 Risers and treads

All stairs providing access to and within *buildings* should be designed to be accessible by most persons with reduced mobility.

Open risers on a *flight* can be a hazard. When ascending a stair, people may be at risk of trapping the toes of shoes beneath projecting nosings, and of tripping as a result. In addition, many may feel a sense of insecurity when looking through spaces present between treads.

A stair should have contrasting nosings to assist in identifying the position of treads and risers should be profiled to minimise tripping as shown below. Open rises should not be used unless a stair is intended for descent only, such as in a dedicated *escape stair* on an *escape route*.

Diagram - Step profile examples



However a *private stair* may be *constructed* with open risers and without contrasting nosings as occupants will be more familiar with the stair through frequent use.

Small children can climb or fall through gaps in stair treads and the size of such gaps should be limited to prevent this. In a *flight* with open rises, the treads should overlap by at least 15 mm. Any opening between adjacent treads in a *flight* should be small enough to prevent the passage of a 100 mm sphere.

4.3.6 Stair landings

Clear space is needed to the head and foot of any stair *flight* to allow people to move between a *flight* and an adjacent level surface safely. People may also wish to pause on stairs, particularly during ascent, and any intermediate landing should provide a temporary respite and be of a size to allow this whilst still permitting others to pass safely.

A stair landing should:

- be provided at the top and bottom of every *flight*. A single landing may be common to 2 or more *flights*; and
- be level except, in external locations, for any minimal crossfall necessary to prevent standing water; and
- have an effective width of not less than the effective width of the stair *flight* it serves; and
- be clear of any door swing or other obstruction, other than to a *private stair*, as noted below.

Length of a landing

The minimum length of a stair landing, measured on the centreline of travel, should be either 1.2 m or the effective width of the stair, whichever is less. However where, on an intermediate landing, a change of direction of 90° or more occurs, the centreline length need not be measured if the

effective width of the stair is maintained across the landing.

On landings to external stair flights, where tactile paving is used, the minimum length of landing should be 1.2 m.

Flights not needing a landing

Other than at an accessible entrance, a landing need not be provided to a *flight* of steps between the external door of:

- a *dwelling* and the ground, balcony, conservatory, *porch* or private garage, where the door slides or opens in a direction away from the *flight* and the total rise is not more than 600 mm; or
- a dwelling, or *building* ancillary to a dwelling, and the ground, balcony, conservatory, or porch, where the change in level is not more than 170 mm, regardless of method of door operation.

Obstructions

On a *private* stair, other than on an intermediate landing, common to 2 flights:

- a door to a cupboard or duct may open onto a top landing if, at any angle of swing, a clear space of at least 400 mm deep is maintained across the full width of the landing;
- a door may open on to a bottom landing, if, at any angle of swing, a clear space of at least 400 mm deep is maintained across the full width of the landing and the door swing does not encroach within space designated for future installation of a stair lift (see clause 4.2.8).

4.3.7 Warning surfaces to landings of external steps

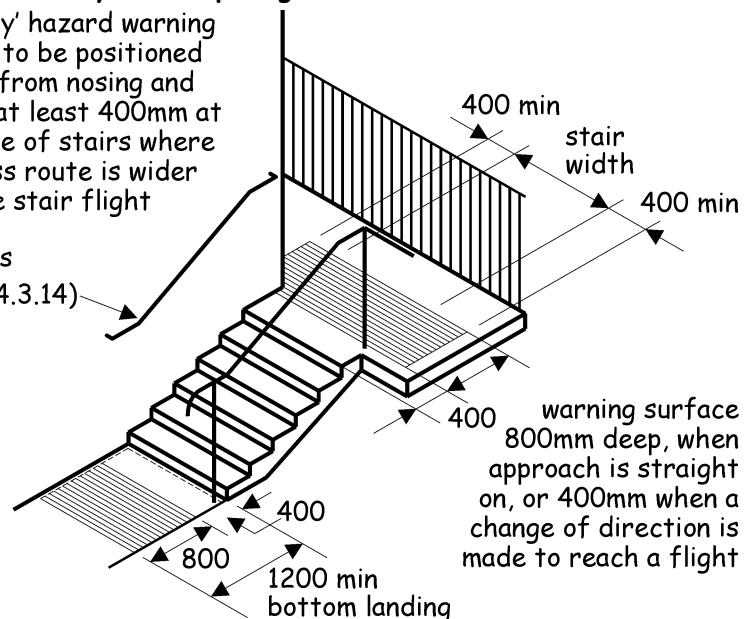
A sudden and unguarded change of level on an access route can present a hazard to a person with a visual impairment. Therefore, on external routes serving more than one dwelling, tactile paving should be used to alert people to the presence of a *flight* of steps.

The use of 'corduroy' tactile paving identifies this hazard and advises users to 'proceed with caution'. It should be provided at the head and foot of any *flight* of external steps, forming a strip 800 mm deep, positioned 400 mm from the first step edge, as noted below.

Use of corduroy tactile paving

'corduroy' hazard warning surface to be positioned 400mm from nosing and extend at least 400mm at each side of stairs where an access route is wider than the stair flight

handrails
(clause 4.3.14)



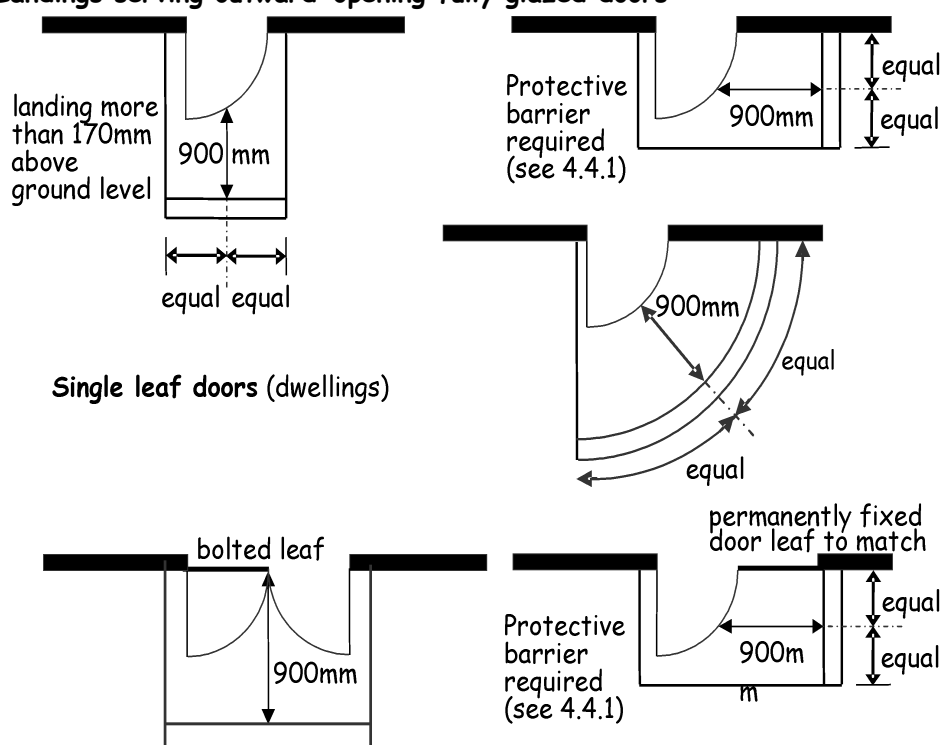
On any landing mutual to a *flight* of steps and a ramp, tactile paving should lie outwith the landing area of any ramp flight, to prevent possible confusion which might lead to injury.

General information on use of tactile paving, including options on intermediate landings, is given in 'Guidance on the Use of Tactile Paving Surfaces'.

4.3.8 Stair landings serving outward opening fully glazed doors

Conservatories and similar extensions are an increasingly prevalent addition to many *dwellings*. If the *conservatory* or extension is intended to be the accessible entrance, the guidance to standard 4.1 should be followed. If the entrance is not the accessible entrance and has an outward opening fully *glazed* door, a landing, of a length shown in the following diagram should be in accordance with the guidance in clause 4.3.6. These recommended landing lengths may also be appropriate for fully *glazed* doors leading from a *dwelling* directly into a *conservatory*.

Landings serving outward-opening fully glazed doors



Double leaf doors (dwellings)

4.3.9 Stair flights consisting of both straight and tapered treads

On that part of a *flight* consisting of tapered treads, the going of the tapered treads should be uniform and should not be less than the going of the straight treads. At the inner end of the tread, the going should be at least 50 mm. Tapered treads on a stair should be *constructed* in accordance with BS 585: Part 1: 1989, Appendices B1 and B3, irrespective of material or whether it contains open rises. However guarding should be in accordance with the guidance in clause 4.4.2.

In a *flight* less than 1 m wide the going should be measured at the centre line of the *flight* as described in clause 4.3.1. In a *flight* 1 m wide or more the going should be measured at 2 points, 270 mm from each end of the tread, as described in clause 4.3.1 and the minimum going should be at least the going of the straight treads.

4.3.10 Stair flights consisting wholly of tapered treads

Stairs formed from tapering treads, particularly where forming a spiral, can present greater difficulties in use for many people than straight flights. There should be an appropriate level of safety and amenity on such stairs, particularly where used as a primary means of access.

A *flight* consisting wholly of tapered treads, forming a helix or spiral, should be *constructed* to give safe passage. To achieve this, it should be *constructed* in accordance with the guidance in BS 5395: Part 2: 1984, but account should be taken of the following guidance clauses:

- minimum and maximum rise should be as recommended in clause 4.3.2; and
- the effective width should be as recommended in clause 4.3.3; and
- the maximum number of rises on a *flight* should be as recommended in clause 4.3.4; and
- other than on a *private* stair, risers and treads should be as recommended in clause 4.3.5; and
- handrails should be as recommended in clauses 4.3.14 and 4.3.15; and
- protective barriers should be as recommended in clause 4.4.2.

4.3.11 Pedestrian ramps

Surfaces with a gradient of 1 in 20 to not more than 1 in 12 are considered to be ramps and recommendations are made on such surfaces to ensure the safety and amenity of users. Gradients of more than 1 in 12 are considered too steep to negotiate safely and are not recommended.

Steep gradients require both greater effort to ascend and more care when descending. As a general principle, the steeper the gradient of a ramp, the shorter the *flight* should be. A pedestrian ramp should be *constructed* in accordance with the following table:

Gradient, length and rise of a flight in a pedestrian ramp

Maximum gradient of <i>flight</i>	Maximum length of <i>flight</i>	Maximum rise
1 in 20	10 m	500 mm
1 in 15	5 m	333 mm
1 in 12	2 m	166 mm
More than 1 in 12	Not recommended	not recommended

Notes:

1. The maximum *flight* length for a particular gradient can be interpolated as follows: 3 m long for a gradient of 1 in 13, 4 m long for a gradient of 1 in 14, and so on.

4.3.12 Width of ramps flights

The width of a ramp should relate to the intensity of use. For example, an unobstructed width of 1.8 m is the minimum that will allow two wheelchair users to pass safely. As a ramp *flight* will normally be enclosed between flanking handrails or guarding, it is important that this width still offers safe and convenient passage.

The effective width of a ramp *flight* should be at least 1.0 m. Effective width is measured between handrails, or where there are no handrails, the protective barrier or inside face of any wall or guarding kerb, and should be clear of any obstructions.

4.3.13 Ramp landings

Clear space is needed to the head and foot of any ramp *flight* to allow people to move between a *flight* and an adjacent level surface safely. This should permit manoeuvring of a wheelchair without obstructing passage or the need to encroach into circulation routes or onto a ramp flight.

A ramp landing should:

- be provided at the top and bottom of every *flight*. A single landing may be common to 2 or more *flights*; and
- be level except, in external locations, for any minimal crossfall necessary to prevent standing water; and
- have an effective width not less than the effective width of the *flight* it serves; and
- be clear of any door swing or other obstruction.

The unobstructed length of a landing should be not less than 1.5 m, to allow space for wheelchairs or prams to stop after travelling down a *flight* and to provide manoeuvring space.

Where the entire length of a series of ramp *flights* is not visible from either the top or bottom landing, intermediate landings should have an effective width of not less than 1.8 m, to provide passing places during ascent or descent.

4.3.14 Handrails to stairs and ramps

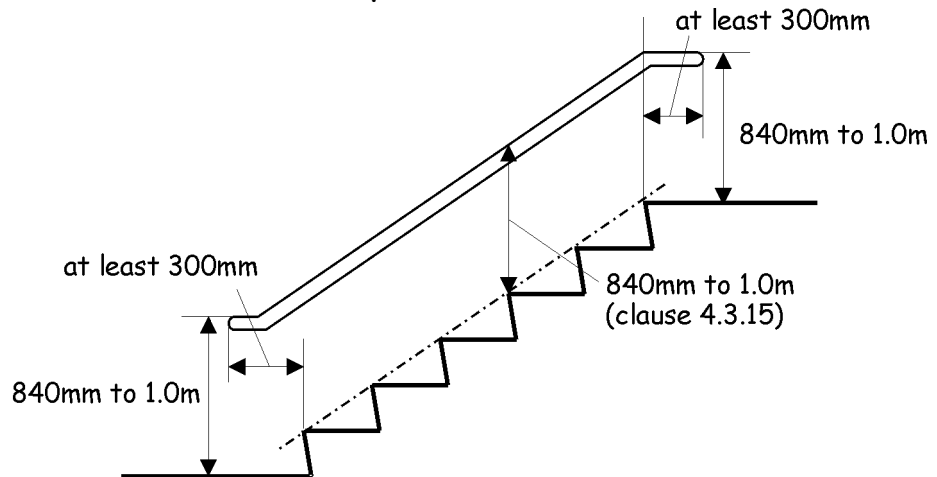
Handrails to a stair and ramp *flights* will provide support and assist safe passage. As the full width of a *flight* may be used, either by people passing or by person who favours one side, a handrail should generally be provided to both sides of a stair or ramp flight.

A handrail should be provided to both sides of any *flight* where there is a change of level of more than 600 mm, or where the *flight* on a ramp is longer than 2 m. However:

- handrails may be omitted to the *flight* of a ramp, serving a single dwelling, where the change in level is less than 600mm; and
- a handrail need only be provided to one side on a *flight* of a *private* stair.

Where a handrail is provided to only one side of a *private stair* flight, the side on which a handrail is not fixed should permit installation of a second handrail at a future date. A second handrail will provide additional support to a person using the stair and may be installed provided a clear width of 800 mm is maintained.

Handrails to stairs and ramps



The extension of a handrail at landings allows an individual to steady themselves before ascending or descending. For a person with impaired vision, the change in slope of the handrail and its return into a wall can also signal the start or finish of a flight.

A handrail on a stair or ramp *flight* should:

- extend at least 300 mm beyond the top and bottom of the *flight* as shown in the diagram above. However the 300 mm extension may be omitted where the handrail abuts a newel post; and
- have a profile and projection that will allow a firm grip; and
- end in a manner, such as a scrolled or wreathed end, that will not present a risk of entrapment to users; and
- contrast visually with any adjacent wall surface.

However only sub clause b need be provided on a *private stair* or to a ramp providing access within a single dwelling, as users are likely to be familiar with the layout and use of the flight.

A stair or ramp that is more than 2.3 m wide should be divided by a handrail, or handrails, in such a way that each section is at least 1.1 m and not more than 1.8 m wide. This does not apply to a stair between an entrance door to a *building* and ground level, where not forming part of an *escape route*.

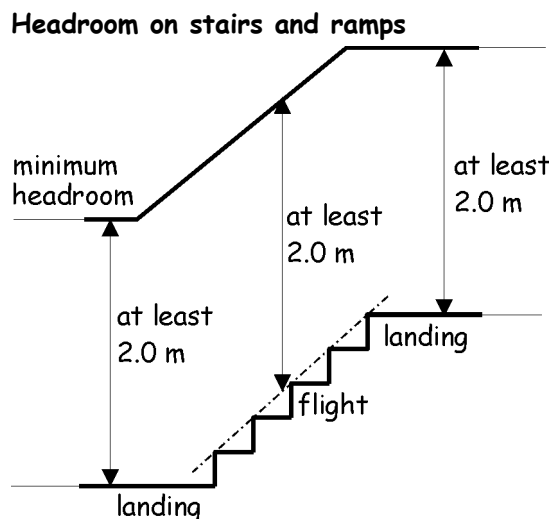
4.3.15 Height of handrails

A handrail should be fixed at a height of at least 840 mm and not more than 1.0 m, measured vertically above the pitch line of a *flight* on a stair or ramp and on a landing where a handrail is provided.

4.3.16 Headroom on stairs and ramps

A *flight* or landing on a stair or ramp should have clear headroom of at least 2.0 m extending over the whole of the effective width. Height should be measured vertically from the pitch line of the *flight* or from the surface of the landing.

In a *dwelling* where any portion of a *flight* or landing lies outwith the area needed to maintain the effective width of a *flight* or landing, a reduction in headroom may be considered, provided that no dangerous obstructions or projections are created.



4.3.17 Industrial stairs and fixed ladders

An industrial stair or fixed ladder serving an area in any *building* to which only limited access is provided should be *constructed* so as to offer safe passage. This method of access is not for public use and would only be expected to be provided in places such as plant-rooms. A stair or ladder should be *constructed* in accordance with:

- a. BS 5395: Part 3: 1985 or BS 4211: 2005, as appropriate; or
- b. BS 5395: Part 2: 1984 where the stair is a spiral or helical stair.

4.4 Pedestrian protective barriers

- 4.4 Functional standard
- 4.4.0 Introduction
- 4.4.1 Location of pedestrian protective barriers
- 4.4.2 Design of pedestrian protective barriers
- 4.4.3 Guarding to the edge of ramps

standard

4.4

mandatory

Every *building* must be designed and *constructed* in such a way that every sudden change of level that is accessible in, or around, the *building* is guarded by the provision of pedestrian protective barriers.

Limitation:

This standard does not apply where the provision of pedestrian protective barriers would obstruct the use of areas so guarded.

4.4.0 Introduction

Protective barriers are necessary to prevent people in and around *buildings* from an accidental fall at an unguarded change of level.

In assessing the type of barrier to be used, the likely hazards, the use of the *building* and the risks to the people that may be present should all be considered. Any barrier should minimise the risk of persons falling or slipping through gaps in the barrier. This is particularly important in all *domestic* buildings, where children will generally be present.

The height and form of a barrier are both important, particularly to prevent a fall resulting from an intentional act, such as climbing. Young children are often adept at climbing anything within their reach. It is important therefore that barriers are designed to minimise potential hand and footholds within dwellings, and within common areas and on access routes to *domestic* buildings.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirements of this standard in so far as is *reasonably* practicable, and in no case be worse than before the *conversion* (regulation 12, schedule 6).

4.4.1 Location of pedestrian protective barriers

In the interests of safety, protective barriers should be provided where there is a sudden change in level and the possibility of severe injury from a fall.

At a change of direction on an access route, a drop of any height can be a hazard, particularly to a wheelchair user or a person with a visual impairment. A protective barrier should be provided where a significant drop occurs and in locations where a smaller change of level may increase the risk of injury.

It is not practical to provide a barrier at every change in level, but a protective barrier for pedestrians should be provided at the edge of:

- a. every floor, stair, ramp, landing, raised floor or other raised area to which people have access, where there is a difference in level of 600 mm or more; and
- b. any change in direction on an access or circulation route which is raised above the level of the surrounding surfaces.

However there is no need to provide a protective barrier in a location which would prevent intended access or be incompatible with the normal use of an area, such as to the edge of a loading bay.

A wall, partition or area of fixed glazing, *constructed* in accordance with the recommendations of clause 4.4.2, may act as a protective barrier.

To ensure a person can be aware of the presence of a protective barrier it should, unless within a *dwelling* or forming part of a wall or partition, contrast visually with surrounding surfaces. If a barrier is principally *glazed*, the recommendations for marking given in clause 4.8.2 should be followed.

4.4.2 Design of pedestrian protective barriers

In and around *domestic* buildings, gaps in any protective barrier should not be large enough to permit a child to pass through.

To ensure this, openings in a protective barrier should prevent the passage of a 100 mm diameter sphere. However the space between a rise in a stair and the lowest edge of the protective barrier may be larger than 100 mm, provided the lowest edge of the barrier is not more than 50 mm above, and parallel to, the pitch line of the stair.

A protective barrier, and any wall, partition or fixed *glazing* accepted instead of a barrier should be secure, capable of resisting loads calculated in accordance with BS 6399: Part 1: 1996 and be of a height as follows:

Height of pedestrian protective barriers

Location	Minimum height (mm) [1]
at the edge of a floor in front of walls, partitions and fixed <i>glazing</i> incapable of withstanding the loads specified in BS 6399: Part 1: 1996	800
in front of an openable window	800 [2]
on a stair or ramp <i>flight</i> wholly within a <i>dwelling</i>	840 [3]
on a stair or ramp <i>flight</i> outwith a <i>dwelling</i>	900 [3]
to a gallery, landing or raised area within a <i>dwelling</i>	900
all other locations	1100

Notes:

1. A handrail provided in accordance with clauses 4.3.14 and 4.3.15 may form the top of a protective barrier if the heights in this table are met.
2. Protective barriers should be installed where the opening window has:
 - a. a sill that is less than 800 mm above finished floor level; and
 - b. an operation that will allow the possibility of falling out; and
 - c. a difference in level between the floor level and the ground level of more than 600 mm.

At 2 storeys or more above ground level, reference should be made to clause 4.8.4. where external *glazing* is cleanable from within the *building*.
3. Where a handrail forming the top of a protective barrier to a *flight* meets a protective barrier to a landing, the height of the latter may be reduced for a distance not more than 300 mm to permit a smooth junction.

4.4.3 Guarding to the edge of ramps

Where a continuous pedestrian protective barrier is not provided to the edge of a ramp flight, a kerb upstand of at least 100 mm high should be provided to any open side of the *flight* where there is a drop of any height. However the use of an upstand kerb alone in open landscaping is not recommended as it may present a potential trip hazard.

Alternatively, an external ramp *flight* may be provided with a landscaped margin, level with the edge or the ramp for a distance of 600 mm before any grading.

4.5 Electrical safety

- 4.5 Functional standard
- 4.5.0 Introduction
- 4.5.1 Electrical installations
- 4.5.2 Extra-low voltage installations
- 4.5.3 Installations operating above low voltage

<div><div>standard</div><div>4.5</div><div>mandatory</div></div>	<p>Every <i>building</i> must be designed and <i>constructed</i> in such a way that the electrical installation does not:</p> <p>(a) threaten the health and safety of the people in, and around, the <i>building</i>; and</p> <p>(b) become a source of fire.</p> <p>Limitation:</p> <p>This standard does not apply to an electrical installation:</p> <p>(a) serving a <i>building</i> or any part of a <i>building</i> to which the Mines and Quarries Act 1954 or the Factories Act 1961 applies; or</p> <p>(b) forming part of the works of an undertaker to which regulations for the supply and distribution of electricity made under the Electricity Act 1989.</p>
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4.5.0 Introduction

The hazards posed by unsafe electrical installation are injuries caused by contact with electricity (shocks and burns) and injuries arising from fires in *buildings* ignited through malfunctioning or incorrect installations.

Concern has been expressed that risks have been increasing in recent years due to:

- the increasing prevalence and variety of electrical systems in *buildings* and the demands being made on them;
- the reduction in subscription to voluntary industry self-regulation schemes.

The intention of this standard is to ensure that electrical installations are safe in terms of the hazards likely to arise from defective installations, namely fire, electric shock and burns or other personal injury. Installations should:

- safely accommodate any likely maximum demand; and
- incorporate appropriate automatic devices for protection against overcurrent or leakage; and
- provide means of isolating parts of the installation or equipment connected to it, as are necessary for safe working and maintenance.

The standard applies to fixed installations in *buildings*. An installation consists of the electrical wiring and associated components and fittings, including all permanently secured equipment, but excluding portable equipment and appliances.

Appendix 6 of BS 7671: 2008 (The Wiring Regulations) provides specimen certificates that may be completed by the person responsible for the installation. These can be issued to the person ordering the *works* as evidence of compliance with the recommendations of the British Standards.

Socket outlet

‘Socket outlet’ means a fixed device containing contacts for the purpose of connecting to a supply of electricity the corresponding contacts of a plug attached to any current-using appliance.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirement of this standard (regulation 12, schedule 6).

4.5.1 Electrical installations

Electricity, when properly used, is a safe and convenient source of energy for heat, light and power within *buildings*. However misuse may lead to significant harm to individuals and *buildings* alike.

Risk of fire from an electrical installation should be minimised. In normal operation, taking into account the surroundings, it should not create the risk of fire, burns, shock or other injury to people.

An electrical installation should be designed, *constructed*, installed and tested such that it is in accordance with the recommendations of BS 7671: 2008.

Professional expertise

Electrical installation *work* should be inspected and tested by persons who possess sufficient technical knowledge, relevant practical skills and experience for the nature of the electrical *work* undertaken.

An approved certifier of construction who has been assessed to have the professional skills and relevant experience, can certify compliance of an electrical installation (see clause 4.0.5).

4.5.2 Extra-low voltage installations

To avoid the risk of harm, any circuit which is designed to operate at or below extra-low voltage should be protected against both direct and indirect contact with any other circuit operating at higher than extra-low voltage.

Extra-low voltage is defined as not more than 50 volts alternating current or 120 volts direct current, measured between conductors or to earth. This might include installations for alarm or detection purposes, or for transmission of sound, vision, data or power.

Any such installation should be designed, *constructed*, installed and tested such that it is in accordance with the recommendations of BS 7671: 2008.

4.5.3 Installations operating above low voltage

To avoid the risk of harm, any circuit which is designed to operate at a voltage higher than low voltage should be provided with a cut-off switch for use in emergency in accordance with the recommendations of BS 7671: 2008. Such installations are not usual in *domestic buildings*.

Low voltage is defined as not more than 1000 volts alternating current or 1500 volts direct current, measured between conductors or not more than 600 volts alternating current or 900 volts direct current between conductors and earth.

A fireman's switch, in a conspicuous position, should be provided to any circuit supplying exterior electrical installations or internal discharge lighting installations (including luminous tube signage) operating at a voltage exceeding low voltage.

4.6 Electrical fixtures

- 4.6 Functional standard
- 4.6.0 Introduction
- 4.6.1 Lighting
- 4.6.2 Lighting in common areas of domestic buildings
- 4.6.3 Door entry systems
- 4.6.4 Socket outlets

standard
4.6
mandatory

Every *building* must be designed and *constructed* in such a way that electric lighting points and socket outlets are provided to ensure the health, safety and convenience of occupants and visitors.

Limitation:
This standard applies only to *domestic buildings* where a supply of electricity is available.

4.6.0 Introduction

Visual perception increases with the level of light falling on the surface of an object. It is important to avoid hazardous situations that may be created by the nature of the lighting itself including insufficient light sources, glare, gloom and shadows.

During daylight, lighting levels within a *building* are generally much less than those outdoors. In lobby areas, transitional lighting will assist the eye in adjusting quickly between exterior and interior lighting conditions. Careful design of lighting can also play an important part in emergency situations, to ensure the safe and effective evacuation of people in an emergency.

Section 2 (Fire) includes guidance on *escape route* lighting and emergency lighting, whilst section 6 (Energy) covers energy efficient design of lighting.

Aside from the specific issues noted above and in guidance to this standard, general guidance on lighting in *buildings* remains outwith the scope of the Technical Handbook. There are, however numerous publications offering guidance on use of lighting in *buildings* for safety and amenity, including those listed below:

- Code for Lighting – CIBSE (2002);
- Building Sight - Royal National Institute for the Blind (1995).

The provision of an entryphone system to a communal entrance will enhance both the amenity and the security of occupants within a building.

Today, with ever more electrical appliances being used in homes, an adequate provision of power points reduces the possibility of both overloading of individual sockets, risking fire, and the creation of trip hazards from use of extension cabling.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirement of this standard (regulation 12, schedule 6).

4.6.1 Lighting

A *dwelling* should have an electric lighting system providing at least one lighting point to every circulation space, kitchen, bathroom, *toilet* and other space having a floor area of 2 m² or more.

Any lighting point serving a stair should have controlling switches at, or in the immediate vicinity of, the stair landing on each storey.

4.6.2 Lighting in common areas of domestic buildings

In communal areas and particularly on stairs and ramps within a building, the possibility of slips, trips and falls and of collision with obstacles should be minimised. Lighting conditions play an important part in this.

Common areas should have artificial lighting capable of providing a uniform lighting level, at floor level, of not less than 100 lux on stair *flights* and landings and 50 lux elsewhere within circulation areas. Lighting should not present sources of glare and should avoid creation of areas of strong shadow that may cause confusion or miss-step. A means of automatic control should be provided to ensure that lighting is operable during the hours of darkness.

4.6.3 Door entry systems

Entry to *buildings* containing *flats* or *maisonettes* is controlled to maintain the security of a private space and to prevent vandalism. Similarly, the principal entrance to a *sheltered housing complex* may have an access control system for the general security and safety of residents.

A common entrance door, intended as a principal means of access to a building, should have a door entry system installed. This should comprise of a remote door release and intercom at the point of entry and a call unit within each *dwelling* served by that entrance.

Any unit at a common entrance should be positioned between 900 mm and 1.2 m above floor level. It should include an inductive coupler compatible with the 'T' setting on a personal hearing aid, together with a visual indicator that a call made has been received. Controls should contrast visually with surrounding surfaces and any numeric keypad should follow the 12-button telephone convention, with an embossed locator to the central '5' digit.

4.6.4 Socket outlets

Current lifestyle places a greater demand on electrical installations, with the increase in use of electrical appliances. Connection of multiple appliances into a socket outlet through an adapter can lead to overheating and the risk of fire. Similarly, use of extension leads can create a trip hazard.

To reduce these risks, a *dwelling* should be provided with at least the following number of 13A socket outlets:

- 4 within each apartment; and
- 6 within the kitchen, at least 3 of which should be situated above worktop level in addition to any outlets provided for floor-standing white goods or built-in appliances; and
- an additional 4 anywhere in the dwelling, including at least 1 within each circulation area on a level or storey.

Sockets may be installed as single or double outlets, to give the recommended number of outlets in each space.

4.7 Aids to communication

4.7 Functional standard

4.7.0 Introduction

standard

4.7

mandatory

Every *building* must be designed and *constructed* in such a way that it is provided with aids to assist those with a hearing impairment.

Limitation:

This standard does not apply to *domestic buildings*.

4.7.0 Introduction

This standard does not apply to *domestic* buildings.

4.8 Danger from accidents

- 4.8 Functional standard
- 4.8.0 Introduction
- 4.8.1 Collision with projections
- 4.8.2 Collision with glazing
- 4.8.3 Cleaning of windows and rooflights
- 4.8.4 Guarding of windows for cleaning
- 4.8.5 Access to manual controls

standard
4.8
mandatory

- Every *building* must be designed and *constructed* in such a way that:
- (a) people in and around the *building* are protected from injury that could result from fixed glazing, projections or moving elements on the building;
 - (b) fixed *glazing* in the *building* is not vulnerable to breakage where there is the possibility of impact by people in and around the building;
 - (c) both faces of a window and rooflight in a *building* are capable of being cleaned such that there will not be a threat to the cleaner from a fall resulting in severe injury;
 - (d) a safe and secure means of access is provided to a roof; and
 - (e) manual controls for ventilation and for electrical fixtures can be operated safely.

Limitation:
Standards 4.8(d) does not apply to *domestic* buildings.

4.8.0 Introduction

This standard covers several unrelated safety issues that do not lend themselves to inclusion in other standards although glass and *glazing* do figure prominently.

Collision or entrapment accidents result in a significant numbers of deaths and injuries to people in and around *buildings* every year. The majority of these accidents occur during normal use and involve *building* features such as doors, windows and areas of fixed glazing, with the risk of injury increased where vulnerable glass is involved. Collisions with *glazing* are very common as it can, if transparent, be difficult to see and may create confusing lighting effects, presenting particular difficulties for a person with a visual or cognitive impairment.

Falls still result in deaths and serious injury to people while cleaning windows. Whether windows are cleaned professionally or by the *building* owner, provision should be made to permit *glazing* to be cleaned safely.

Natural ventilation in *dwellings* is provided by openable windows or rooflights. People may encounter difficulty and a hazard may arise in operating controls which are poorly sited. Similarly, location of electrical sockets, switches and other controls can, if not considered carefully, affect safe and convenient use.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirements of this standard in so far as is *reasonably* practicable, and in no case be worse than before the *conversion* (regulation 12, schedule 6).

4.8.1 Collision with projections

Fixtures that project into, or open onto any place to which people have access can be a hazard. Any element of a *building* capable of projecting into a circulation route or space should be positioned, secured or guarded so that it does not present a risk to *building* users.

The simple way to avoid risk is to ensure that obstructions do not encroach into such spaces. However where a *building* element does project into a circulation route or space, and any part of the obstruction is less than 2.0 m above the ground, guarding should be provided to both highlight the hazard and prevent collision with the *building* element.

Guarding should be provided to:

- any moveable projection, such as a door leaf or window frame, that opens across a circulation route or into a circulation space; or
- any permanent projection of more than 100 mm into a circulation route or space that begins at a height of more than 300 mm above the ground, or the projection of which increases with height by more than 100 mm; or
- any accessible area where headroom reduces to less than 2.0 m, such as beneath a stair flight.

Guarding should comprise of a continuous horizontal rail, at a height of between 900 mm and 1.1 m above ground level and a solid element, such as kerb upstand or rail, positioned approximately 100 mm above ground level, to assist in detection by a visually impaired person using a cane.

There should be visual contrast between guarding rails and surrounding surfaces. Consideration should be given to positioning of guarding to direct a person away from the hazard, further reducing the risk of a collision.

Additional guarding may be needed to prevent collision with, or entrapment by, a powered door leaf (see clause 4.1.8).

Within a dwelling, guarding is not needed. A door swing may open into a circulation space provided no obstructions occur within the unobstructed area on a stair landing (see clause 4.3.6), on a ramp landing or that would prevent future installation of a stair lift (see clause 4.2.8).

4.8.2 Collision with glazing

Glazing in certain locations is more vulnerable to human impact. Care should be taken in the selection of *glazing* at low level in screens, walls and partitions or in areas surrounding doors, particularly where *glazed* side panels may be mistaken for doors.

To reduce the risk of injuries from accidental human impact in these locations, designers should either:

- fit *glazing* of a type, thickness and pane size that will be resistant to impact, which either does not break or breaks safely; or
- provide protection in the form of guarding to vulnerable glazing.

Glazing should be designed to resist human impact as set out in BS 6262: Part 4: 2005, where all, or part, of a pane is:

- within 800 mm of floor level; or
- part of a door leaf; or
- within 300 mm of a door leaf and within 1.5 m of floor level.

Glazing manifestation Large areas of transparent glazing, in fixed screens or partitions or where forming doors, can be difficult to identify and may be a particular hazard to a person with a visual impairment. Glazing in a building, positioned where accidental collision may be likely, should be made apparent by some form of manifestation (marking). Differences in the design of manifestation used can also assist in identifying the position of doors within a *glazed* screen.

Manifestation should be of a size and form that is immediately obvious. It should, as far as is *reasonably practicable*, contrast visually with backgrounds viewed through the *glazing* by a person approaching from either side. Forms might include broken or solid lines, patterns or logos and may be a continuous element or at appropriate horizontal intervals. Manifestation should be present within 2 height ranges, between 850 mm and 1.0 m, and between 1.4 m and 1.6 m above floor level. It should be permanent, e.g. screen printed or opaque etching or a durable applied material which is not easily removed.

Unframed *glazed* doors In addition, any unframed *glazed* door which operates on a pivot action should have any exposed vertical edge highlighted to contrast visually with surroundings, to assist in identifying the door edge when opening or in an open position. This is particularly important on powered doors.

Manifestation or highlighting of door edges need only be provided within *dwelling*s where *glazing* installations are unusual. Familiar elements such as patio doors should not usually attract marking.

4.8.3 Cleaning of windows and rooflights

Falls account for most window cleaning accidents, and generally occur from loss of balance through over-extension of reach or due to breakage of part of the *building* fabric through improper use or access. It is therefore important that transparent or translucent *glazing* should be designed so that it may be cleaned safely.

There is, however no need to provide for the safe cleaning of any *glazed* element that is opaque and does not allow the passage of light.

Any window or rooflight, all or part of which is more than 4 m above adjacent ground or internal floor level, should be *constructed* so that any external and internal *glazed* surfaces can be cleaned safely from:

- a. inside the *building* in accordance with the recommendations of Clause 8 of BS 8213: Part 1: 2004; or
- b. a loadbearing surface, such as a balcony or catwalk, large enough to prevent a person falling further; or
- c. a window access system, such as a cradle or travelling ladder, mounted on the *building*, as described in Annex C3 of BS 8213: Part 1: 2004.

Rooflights in *dwelling*s However within a dwelling, any rooflight, all of which is more than 1.8 m above both adjacent ground and internal floor level, need not be *constructed* so that it may be safely cleaned.

Glazing in common areas In addition to the above three options, any window or rooflight within a common area of a *domestic building* may be cleaned from a ladder sited on adjacent ground or from an adjacent loadbearing surface which has unobstructed space large enough to allow safe use the a ladder and which will contain a person from falling further. However a ladder should not be used to access any external or internal *glazed* surface more than 9 m above the surface on which the ladder is sited. General guidance on the safe use of

	<p>ladders may be found in HSE information sheet MISC613 'Safety in window cleaning using portable ladders'.</p>
Roof access hatches	<p><i>Glazing</i> within a roof access hatch, located within a <i>roof space</i>, need not be <i>constructed</i> so that it may be safely cleaned.</p>
Cleaning from inside	<p>When cleaning a window from inside, a person should not have to sit or stand on a window sill or use other aids to reach the external face of the window. The criterion of safety is the ability to reach all points on the surface of the external <i>glazing</i> with only the arm projecting outside the line of the window whilst remaining standing on the floor.</p>
'Safe reach'	<p>Ergonomic statistics on reach capabilities for the UK adult population are given in Annex A of BS 8213: Part 1: 2004. As reach may safely be increased to some degree by use of cleaning implements, it would still be considered reasonable to apply a safe limit to downward reach of 610 mm and a safe limit to lateral and vertical reach as an arc with a radius of 850 mm measured from a point not more than 1.3 m above floor level.</p>
Cleaning from a loadbearing surface	<p>Where the window is to be cleaned from a loadbearing surface listed in sub-clause b to this clause, there should be:</p> <ul style="list-style-type: none">• a means of safe access; and• a protective barrier not less than 1.1 m high to any edge of the surface or access to the surface which is likely to be dangerous. <p>This method of cleaning is only appropriate where no part of the <i>glazing</i> is more than 4 m above the loadbearing surface.</p>
Alternative methods	<p>Where there is a need for safe cleaning of <i>glazing</i>, it may be appropriate to consider alternate methods of cleaning, in addition to those listed in guidance, where an equivalent level of safety can be demonstrated.</p>

4.8.4 Guarding of windows for cleaning

For openable windows on the ground and first floor of a *building*, or where the outside face of the *glazing* will not be cleaned from inside the building, no guarding need be provided for the purpose of cleaning *glazing*. However the general guidance for provision of protective barriers given in clause 4.4.2 should be followed.

At greater heights, 2 storeys or more above ground level, where it is intended to clean the outside face of the *glazing* from inside the building, the increased risk from a fall should be recognised and guarding provided to a height of at least 1.1 m above floor level.

Where guarding is provided, it should be designed to conform to BS 6180: 1999. All guarding should be permanently fixed, should not be detachable to permit windows to open and should be designed so that it is not easily climbable by children.

Guarding to a window is not needed where the open window gives access to a fully guarded balcony.

4.8.5 Access to manual controls

The location of a manual control device can have a significant effect on both the ease of operation of the device and safety in use. Positions that are inaccessible present a greater risk of accident when bending or reaching. Any control that is intended for operation by the occupants of a *building* should be installed in position that allows safe and convenient use.

This guidance is applicable to manual controls to openable ventilators, including windows and rooflights and to controls and outlets of electrical fixtures located on a wall or other vertical surface. Unless incorporating a restrictor or other protective device for safety reasons, controls should be operable with one hand.

Windows, rooflights and ventilators

An openable window or rooflight, that provides natural ventilation to meet standard 3.14, should have controls for opening, positioned at least 350 mm from any internal corner, projecting wall or similar obstruction and at a height of:

- not more than 1.7 m above floor level, where access to controls is unobstructed; or
- not more than 1.5 m above floor level, where access to controls is limited by a fixed obstruction of not more than 900 mm high which projects not more than 600 mm in front of the position of the controls, such as a *kitchen* base unit. Where obstruction is greater, a remote means of opening, in an unobstructed location, should be provided; or
- not more than 1.2 m above floor level, in an unobstructed location, within an enhanced *apartment* (see clause 3.11.2) or within accessible *sanitary accommodation* (see clause 3.12.3) not provided with mechanical ventilation.

The above guidance does not apply to windows or rooflights openable only for cleaning or maintenance purposes or that are controlled by an automatic system, or to *trickle* ventilators.

Electrical Fixtures

Outlets and controls of electrical fixtures and systems should be positioned at least 350 mm from any internal corner, projecting wall or similar obstruction and, unless the need for a higher location can be demonstrated, not more than 1.2 m above floor level. This would include fixtures such as sockets, switches, fire alarm call points and timer controls or programmers. Within this height range:

- light switches should be positioned at a height of between 900 mm and 1.1 m above floor level;
- standard switched or unswitched socket outlets and outlets for other services such as telephone or television should be positioned at least 400 mm above floor level. Above an obstruction, such as a worktop, fixtures should be at least 150 mm above the projecting surface.

Where socket outlets are concealed, such as to the rear of white goods in a kitchen, separate switching should be provided in an accessible position, to allow appliances to be isolated.

4.9 Danger from heat

- 4.9 Functional standard
- 4.9.0 Introduction
- 4.9.1 Installation of unvented hot water storage systems
- 4.9.2 Specification of small unvented hot water storage systems
- 4.9.3 Discharge from unvented hot water storage systems
- 4.9.4 Discharge of steam or hot water
- 4.9.5 Hot water discharge from sanitary fittings

<div><div>standard</div><div>4.9</div><div>mandatory</div></div>	Every <i>building</i> must be designed and <i>constructed</i> in such a way that protection is provided for people in, and around, the <i>building</i> from the danger of severe burns or scalds from the discharge of steam or hot water.
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4.9.0 Introduction

Guidance is given under this standard on a number of issues relating to hot water safety.

Unvented hot water storage systems

Guidance is given to minimise the risk of explosion due to malfunction of an unvented hot water vessel by:

- ensuring that such installations are carried out by appropriately qualified personnel; and
- requiring a minimum range of safety devices be fitted to any such installation to prevent the temperature of the stored water exceeding 100° C.

It is not intended that this guidance should be applied to storage systems with a capacity of less than 15 litres, to systems used solely for space heating or to any system used for an industrial or commercial process.

Guidance is given on systems of up to 500 litres storage capacity, where power input does not exceed 45kW. Installations above this size are not usual in *domestic buildings* . It is unlikely that many larger installations will be installed in *dwelling*s but if required, additional guidance on such installations is provided to standard 4.9 of the non-domestic Technical Handbook.

Hot water overflows

Guidance is given on provision for the safe removal of the discharge created by the normal operation of safety devices in such an installation and on ensuring discharge of hot water and steam from any installation, unvented or otherwise, to a safe and visible location.

Sanitary facilities

Measures to prevent scalding from hot water are now addressed for certain *sanitary facilities* used for personal hygiene.

Maintaining safety devices

Safety devices installed to protect from hazards such as scalding or the risk of explosion of unvented systems should be maintained to ensure correct operation. Guidance on maintenance can be provided by both manufacturers and installers of such devices.

Conversions

In the case of *conversions* , as specified in regulation 4, the *building* as *converted* shall meet the requirement of this standard (regulation 12, schedule 6).

4.9.1 Installation of unvented hot water storage systems

Installation of an unvented hot water storage system should be carried out by a person with appropriate training and practical experience.

Competence of installers This might include current membership of a registration scheme operated by a recognised professional body. This could include those administered by the Scottish and Northern Ireland Plumbing Employers Federation (SNIPEF) and the Construction Industry Training Board (CITB) or an equivalent body.

The following points should be noted in relation to installation of an unvented hot water storage system:

- the installer should be a competent person and, on completion, the labelling of the installation should identify the installer;
- the installed system should meet the recommendations of BS EN 12897: 2006, BS 6700: 2009 as appropriate or be the subject of an approval by a *notified body* and incorporate the safety devices outlined in clause 4.9.2;
- certification of the unit or package should be recorded by permanent marking and a warning label which should be visible after installation. A comprehensive installation/user manual should be supplied;
- the tundish and discharge pipework should be correctly located and fitted by the installer and the final discharge point should be visible and safely positioned where there is no risk from hot water discharge.

The operation of the system under discharge conditions should be tested to ensure provision is adequate.

4.9.2 Specification of small unvented hot water storage systems

An unvented hot water storage system should be designed and installed to prevent the temperature of the stored water at any time exceeding 100° C and to provide protection from malfunctions of the system.

An unvented hot water storage system should be in the form of a proprietary unit or package which is in accordance with the recommendations of a relevant standard such as BS EN 12897: 2006, BS 6700: 2009 as appropriate or the subject of approval by a *notified body* to an equivalent level of safety and performance.

Pressure

Pressure controls for a unit or package could include:

- a check valve to prevent backflow; and
- a pressure control valve to suit the operating pressure of the system; and
- an expansion valve to relieve excess pressure; and
- an external expansion vessel or other means of accommodating expanded heated water.

These devices are generally factory-fitted (unit) or supplied for fitting by the installer (package).

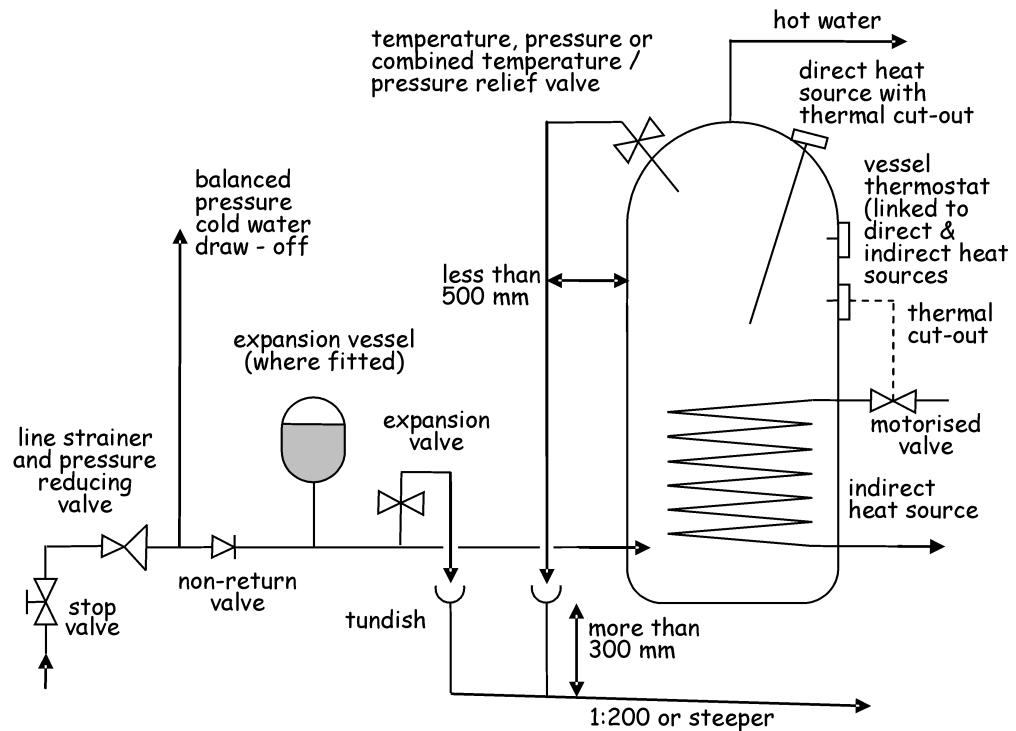
Independent safety devices

A unit or package should have a minimum of 2 independent safety devices. An acceptable approach could be:

- a non self-resetting thermal cut-out; and
- a temperature or pressure relief valve (or combined temperature/pressure relief valve).

These devices should be in addition to any thermostatic control that is fitted to maintain the temperature of the stored water at around 60° C.

Unvented hot water storage system - indirect example



Thermal cut-out

A temperature-operated, non self-resetting, energy cut-out should be fitted to the vessel. In the event of thermostat failure, heating to the water in the vessel should stop before the temperature rises to the critical level required for operation of the safety relief valve.

In indirectly heated vessels, the non self-resetting thermal cut-out should operate a motorised valve, or other similar device, to shut off the flow from the heat source.

On directly heated vessels or where an indirectly heated vessel has an alternative direct method of water heating fitted, a non self-resetting thermal cut-out device should be provided for each direct source.

Safety relief valve

The safety relief valve should be located directly on the storage vessel. The relief valve should conform to relevant national standards such as BS 6283 Part 2: 1991 for temperature relief valves or BS EN 1490: 2000 for combined temperature and pressure relief valves which are set to open at temperatures not normally exceeding 90° C.

The relief valve should have a discharge capacity rating at least equal to the rate of energy (power in kilowatts) input to the heat source. In the case of an indirectly heated unit or package, the valve should be tested to discharge water at a rate not less than 500 kg/h for systems up to 45 kW. The discharge pipework should accommodate this flow rate.

4.9.3 Discharge from unvented hot water storage systems

The removal of discharges of water from the system can be considered in three parts:

Relief valve to tundish

Each valve should discharge into a metal pipe not less than the nominal outlet size of the valve. The discharge pipe should have an air-break, such as a tundish, not more than 500 mm from the vessel relief valve and located in an easily visible location within the same enclosure. Discharge pipes from more than one relief valve may be taken through the same tundish.

Pipework should be installed so that any discharge will be directed away from electrical components should the discharge outlet become blocked.

Tundish to final discharge point

The presence of this air break results in the pressure of the final discharge being no higher than that of a vented system.

The discharge pipe from the tundish to final discharge point should be of a material, usually copper, capable of withstanding water temperatures of up to 95° C and be at least one pipe size larger than the outlet pipe to the relief valve. A vertical section of pipe, at least 300 mm long, should be provided beneath the tundish before any bends to the discharge pipe; thereafter the pipe should be appropriately supported to maintain a continuous fall of at least 1 in 200 to the discharge point.

The pipework should have a resistance to the flow of water no greater than that of a straight pipe 9 m long unless the pipe bore is increased accordingly. Guidance on sizing of pipework from the tundish to the final discharge point is shown in the following table:

Size of discharge pipework

Valve outlet size	Minimum size of discharge pipe to tundish	Minimum size of discharge pipe from tundish	Maximum resistance allowed, expressed as a length of straight pipe i.e. no elbows or bends	Equivalent resistance created by the addition of each elbow or bend
G ½	15 mm	22 mm	Up to 9 m	0.8 m
		28 mm	Up to 18 m	1.0 m
		35 mm	Up to 27 m	1.4 m
G ¾	22 mm	28 mm	Up to 9 m	1.0 m
		35 mm	Up to 18 m	1.4 m
		42 mm	Up to 27 m	1.7 m
G 1	28 mm	35 mm	Up to 9 m	1.4 m
		42 mm	Up to 18 m	1.7 m
		54 mm	Up to 27 m	2.3 m

Annex D to BS 6700: 1997 'Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages' also gives guidance on pipe sizing for water distribution systems.

Discharge pipe termination

The pipe termination should be in a visible location and installed so that discharge will not endanger anyone inside or outside the building.

Ideally, the final discharge point should be above the water seal to an external gully and below a fixed grating. Other methods for terminating the final discharge point would include:

- a. up to 100 mm above external surfaces such as car parks, grassed areas, or hard standings; a wire cage or similar guard should be provided to both prevent contact with discharge and protect the outlet from damage, whilst maintaining visibility;
- b. at high level into a hopper and downpipe of a material, such as cast iron, appropriate for a hot water discharge with the end of the discharge pipe clearly visible;
- c. onto a *flat roof* or pitched roof clad in a material capable of withstanding high temperature discharges of water, such as slate/clay/concrete tiles or metal sheet, with the discharge point a minimum of 3 m from any plastic guttering system that would collect such discharges.

Discharge at high level may be possible if the discharge outlet is terminated in such a way as to direct the flow of water against the external face of a wall. However evidence of the minimum height of the outlet above any surface to which people have access and the distance needed to reduce the discharge to a non-scalding level should be established by test or otherwise.

4.9.4 Discharge of steam or hot water

Any vent or overflow pipe of a hot water system should be positioned so that any discharge will not endanger anyone inside or outside the *building*.

The discharge point of such pipework should be provided in accordance with the guidance given for termination in clause 4.9.3.

4.9.5 Hot water discharge from sanitary fittings

Guidance to the Water Byelaws recommends that, to prevent the development of Legionella or similar pathogens, hot water within a storage vessel should be stored at a temperature of not less than 60°C and distributed at a temperature of not less than 55° C.

If water is supplied at high temperature, from any source, there is a danger of scalding to *building* users. Risk of severe injury increases proportionally with increase in temperature and with extent of contact.

To prevent scalding, the temperature of hot water, at point of delivery to a bath or bidet, should not exceed 48° C.

A device or system limiting water temperature should not compromise the principal means of providing protection from the risk of Legionella. It should allow flexibility in setting of a delivery temperature, up to a maximum of 48° C, in a form that is not easily altered by *building* users. This will allow reduction of temperature where, for example, facilities are used by those more at risk from injury, such as elderly people or unsupervised children.

Guidance to the Water
Byelaws

Facilities used for
personal hygiene

www.tmva.org.uk	Where both hot and cold water are supplied to a facility, the above may be achieved by use of a thermostatic mixing valve (TMV) or fitting complying with BS EN 1111: 1999 or BS EN 1287: 1999, fitted as close to the point of delivery as practicable. Guidance on the installation, use and maintenance of thermostatic mixing valves and fittings can be found in BRE information Paper IP 14/03 and from the Thermostatic Mixing Valve Association (TMVA).
Provision within an existing <i>building</i>	Where a <i>dwelling</i> is altered or extended, but not <i>converted</i> , and new <i>sanitary facilities</i> are provided, some primary heat sources, such as older combination boilers, may not be suited to temperature control in the manner given above. In such cases, advice should be sought from equipment manufacturers on compatible means of limiting hot water temperature to controlled facilities.
Health & Safety legislation	The non-domestic Handbook should be referred to for duties under Health & Safety legislation relevant to any part of a <i>dwelling</i> used as a place of work.

4.10 Fixed seating

4.10 Functional standard

4.10.0 Introduction

standard

4.10

mandatory

Every *building*, which contains fixed seating accommodation for an audience or spectators, must be designed and *constructed* in such a way that a number of level spaces for wheelchairs are provided proportionate to the potential audience or spectators.

Limitation:

This standard does not apply to *domestic buildings*.

4.10.0 Introduction

This standard does not apply to *domestic buildings*.

4.11 Liquefied petroleum gas storage

- 4.11 Functional standard
- 4.11.0 Introduction
- 4.11.1 LPG storage installations
- 4.11.2 LPG storage – fixed tanks
- 4.11.3 LPG storage - cylinders

standard

4.11

mandatory

Every **building** must be designed and **constructed** in such a way that each liquefied petroleum gas storage installation, used solely to serve a combustion appliance providing space heating, water heating, or cooking facilities, will:

- (a) be protected from fire spreading to any liquefied petroleum gas container; and
- (b) not permit the contents of any such container to form explosive gas pockets in the vicinity of any container.

Limitation:

This standard does not apply to a liquefied petroleum gas storage container, or containers, for use with portable appliances.

4.11.0 Introduction

This guidance deals with domestic supply installations where liquefied petroleum gas (LPG) is stored under pressure at ambient temperatures in fixed vessels larger than 75 kg LPG capacity.

Guidance is also given on the storage of LPG within grouped cylinders, when connected to a supply installation.

The intention of the guidance to this standard is to minimise both the risk of fire spreading to the tank and of the contents of the tank forming explosive gas pockets in the vicinity of any LPG storage container.

All persons concerned with the storage and use of LPG should be aware of the following characteristics and potential hazards:

- the two forms of liquefied petroleum gases that are generally available in the UK are commercial butane and commercial propane;
- LPG is stored as a liquid under pressure. It is colourless and its weight as a liquid is approximately half that of the equivalent volume of water;
- LPG vapour is denser than air, commercial butane being about twice as heavy as air. Therefore the vapour may flow along the ground and into drains, sinking to the lowest level of the surroundings and may therefore be ignited at a considerable distance from the source of the leakage. In still air, vapour will disperse slowly;
- when mixed with air, LPG can form a flammable mixture;
- leakage of small quantities of the liquefied gas can give rise to large volumes of vapour/air mixture and thus cause considerable hazard;
- owing to its rapid vaporisation and consequent lowering of temperature, LPG, particularly in liquid form, can cause severe frost burns if brought into contact with the skin;
- a container that has held LPG and is 'empty' may still contain LPG in vapour form and is thus potentially dangerous.

Conversions

In the case of *conversions*, as specified in regulation 4, the *building* as *converted* shall meet the requirement of this standard (regulation 12, schedule 6).

4.11.1 LPG storage installations

The type, size and location of an LPG storage installation will determine the factors that should be addressed in the *construction* of the facility, to comply with health and safety requirements.

www.hse.gov.uk

The Liquefied Petroleum Gas Association (LPGA) produces and maintains Codes of Practice which give guidance on achieving levels of risk appropriate to compliance with health and safety legislation for the design, *construction* and operation of LPG installations. These Codes have been produced in consultation with the Health and Safety Executive (HSE).

The operation of properties where LPG is stored or is in use are subject to legislation enforced by both the HSE and by the Local Authority.

4.11.2 LPG storage – fixed tanks

A liquefied petroleum gas storage tank, together with any associated pipework connecting the system to a combustion appliance providing space or water heating, or cooking facilities, should be designed, *constructed* and installed in accordance with the requirements set out in the LPGA Code of Practice 1: 'Bulk LPG Storage at Fixed Installations'.

Above-ground tanks should be in accordance with Part 1 – 'Design, Installation and Operation of Vessels Located Above Ground', as amended.

Below-ground tanks should be in accordance with Part 4 – 'Buried/ Mounded LPG Storage Vessels', as amended.

For propane installations, above or below-ground, of not more than 2 tonnes (4500 litres) overall capacity, reference may be made to the simplified guidance given in the LPGA Code of Practice 1: 'Bulk LPG Storage at Fixed Installations': Part 2 – 'Small Bulk Propane Installations for Domestic and Similar Purposes', as amended.

Guidance given in this clause is relevant for all tanks, though specific criteria are noted for tanks below 4 tonnes (9000 litres) LPG capacity. LPG storage tanks in excess of 4 tonnes LPG capacity are uncommon in domestic applications. Guidance for larger installations is contained within the relevant Part of the Code of Practice.

Every tank should be separated from a building, *boundary*, or fixed source of ignition, to:

- a. in the event of fire, reduce the risk of fire spreading to the tank; and
- b. enable safe dispersal in the event of venting or leaks.

Tanks should be situated outdoors, in a position that will not allow accumulation of vapour at ground level. Ground features such as open drains, manholes, gullies and cellar hatches, within the separation distances given in column A of the table overleaf should be sealed or trapped to prevent the passage of LPG vapour.

Tanks should be separated from buildings, *boundaries* or fixed sources of ignition in accordance with the table overleaf:

Separation distances for liquefied petroleum gas storage tanks

Maximum capacity (in tonnes)		Minimum separation distance for above ground tanks (in metres)		
of any single tank	of any group of tanks	From a building, boundary or fixed source of ignition to the tank		between tanks
		A no fire wall [1]	B with fire wall [1]	
0.25	0.8	2.5	0.3 [2]	1.0
1.1	3.5	3.0	1.5 [2]	1.0
4.0	12.5	7.5	4.0	1.0

Notes:

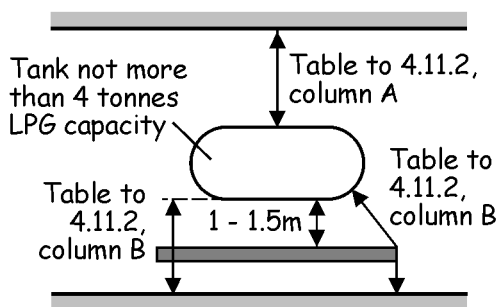
- Fire wall means a wall or screen meeting the guidance for an *external wall* with a fire resistance of short duration (section 2, Fire) within 1 m of the boundary, and located between 1 m and 1.5 m from the tank and extending:
 - longitudinally: so that the distance specified above without the fire wall is maintained when measured around the ends of the fire wall; and
 - vertically: 2 m or the height to the top of the pressure relief valve, whichever is greater.
- For vessels up to 1.1 tonnes capacity, the fire wall need be no higher than the top of the pressure relief valve and may form part of the *site* boundary.

For vessels up to 1.1 tonnes capacity located closer to a *building* than the separation distance in column A of the above table, the fire wall should form part of the wall of the *building* in accordance with the diagram below. Where part of the *building* is used as a *dwelling* (or for residential accommodation), such a fire wall should meet the guidance for an *external wall* with a fire resistance of medium duration (section 2, Fire).

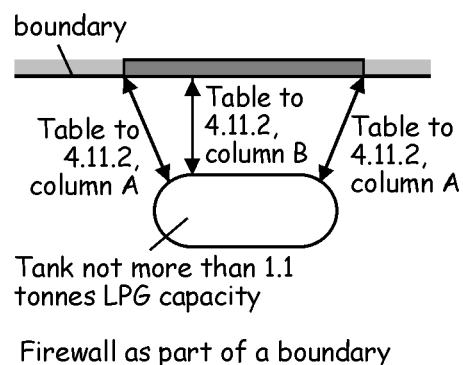
Where a group of tanks are sited together, the number of tanks in a group should not exceed 6 and the total storage capacity of the group should not exceed that given for any group of tanks in the table above.

Separation or shielding of a LPG tank from a building, boundary or fixed source of ignition

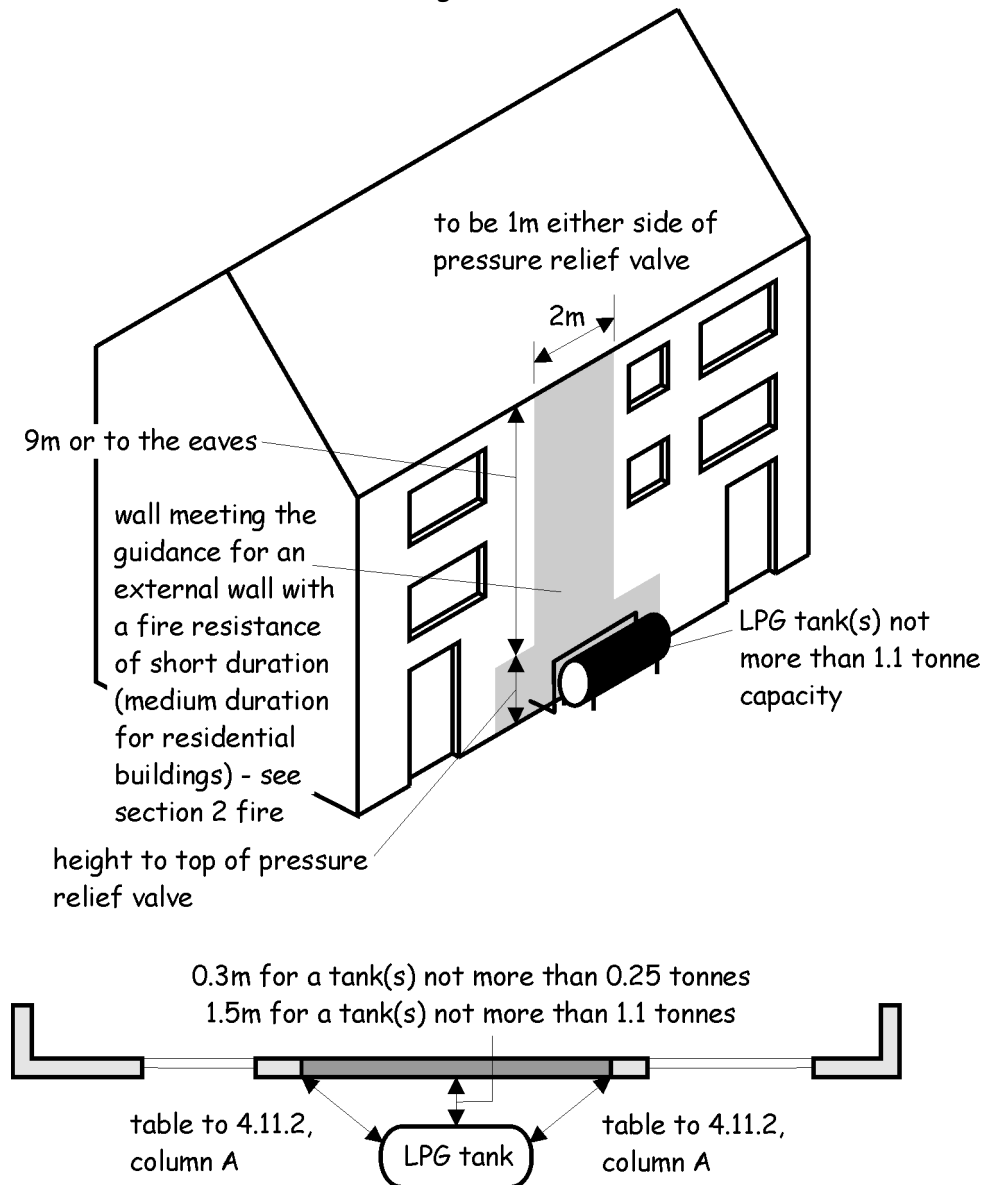
building, boundary or
fixed source of ignition



Plan view with and without firewall



Small LPG tank close to a building



Vehicular parking areas

Motor vehicles under the control of a *site occupier* should be parked at least 6 m from LPG tanks or the separation distance in column A of the table to this clause, whichever is the smaller. This does not apply to the loading/unloading of vehicles. Motor vehicles not under *site* control (e.g. those belonging to members of the public) should be parked no closer than the separation distance in column A of the table to this clause.

4.11.3 LPG storage - cylinders

Where an LPG storage installation consists of a set of cylinders, the installation should be in accordance with the LPGA Code of Practice 24: 'Use of LPG cylinders': Part 1 - 'The Use of Propane in Cylinders at Residential Premises'.

Use of cylinders in a domestic installation commonly takes the form of 2 sets of paired cylinders connected to a manifold, with supply provided from one pair of cylinders at any one time. This allows continuous supply to be maintained when changing empty cylinders.

Any installation should enable cylinders to stand upright, secured by straps or chains against a wall outside the *building*.

Cylinders should be positioned on a firm, level base such as concrete at least 50 mm thick or paving slabs bedded on mortar, and located in a well-ventilated position at ground level, so that the cylinder valves will be:

- a. at least 1 m horizontally and 300 mm vertically from openings in the *buildings* or from heat source such as *flue* terminals or tumble dryer vents;
- b. at least 2 m horizontally from untrapped drains, unsealed gullies or cellar hatches unless an intervening wall not less than 250 mm high is present.

Cylinders should be readily accessible, reasonably protected from physical damage and located where they do not obstruct *exit* routes from the building.

4.12 Vehicle protective barriers

- 4.12 Functional standard
- 4.12.0 Introduction
- 4.12.1 Vehicle protective barriers

standard

4.12

mandatory

Every *building* accessible to vehicular traffic must be designed and *constructed* in such a way that every change in level is guarded.

4.12.0 Introduction

Where vehicles are introduced into a building, measures should be taken to protect people from any additional risks presented. Where areas subject to vehicular traffic are at a level higher than adjacent areas, such as on ramps or platforms, precautions should be taken to ensure that vehicles can not fall to a lower level.

In the assessment of the type of barrier to be provided, the designer should give consideration to the likely hazards, the *building* use and the risks to *building* users.

Conversions

In the case of conversions, as specified in regulation 4, the building as converted shall meet the requirement of this standard (regulation 12, schedule 6).

4.12.1 Vehicle protective barriers

If vehicles have access to a floor, roof or ramp that forms part of a building, a vehicle protective barrier should be provided to the edge of any such area that is above the level of any adjoining floor, ground or any other route for vehicles.

When designing barriers to resist vehicular impact, an estimate of the characteristic mass of the vehicle should be made. Ideally, this should be determined statistically. If this is not possible, the characteristic mass should be taken to be equal to the maximum mass anticipated. Further information on estimation of equivalent static forces for a given characteristic mass and displacement can be obtained in Annex A to BS 6180: 1999.

The designer should, wherever possible, avoid introducing projections on the vehicular face of the barrier and should also consider methods of redirecting vehicles in such a way as to cause minimum damage after impact.

A vehicle protective barrier should be:

- a. capable of resisting loads calculated in accordance with BS 6399: Part 1: 1996; and
- b. of a height at least that given in the table below:

Height of vehicle protective barriers	
Location	Minimum height in mm
Floor or roof edge	400
Ramp edge	600

The minimum height for these barriers relates to the height at which imposed load is applied as described in BS 6399, Part 1: 1996.

In locations used by both vehicles and pedestrians, such as parking areas, additional barrier criteria may apply to edges and changes in level as described in clauses 4.4.1 and 4.4.2.

4.13 Security

- 4.13 Functional standard
- 4.13.0 Introduction
- 4.13.1 Physical security of doors and windows
- 4.13.2 Doors and windows – ‘Secured by Design’
- 4.13.3 Doors and windows – product accreditation
- 4.13.4 Doors and windows – product standards and component performance
- 4.13.5 Installation and fixing of doors and windows

<div><div>standard</div><div>4.13</div><div>mandatory</div></div>	<p>Every <i>building</i> must be designed and <i>constructed</i> in such a way that doors and windows, vulnerable to unlawful entry, can be secured to deter housebreaking and protect the safety and welfare of occupants.</p> <p>Limitation: This standard applies only to <i>domestic buildings</i>.</p>
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4.13.0 Introduction

Whilst police statistics show signs of housebreaking decreasing since 1999, people’s perception of their likelihood of falling victim to this type of crime continues to increase. The 2003 Scottish Crime Survey identified that one in ten people consider it ‘very’ or ‘fairly’ likely that their home would be broken into within the next twelve months. This is an increase on the same response in 2000 and is double the proportion of households who were actually victims of housebreaking in preceding years.

As almost half of the recorded incidents of housebreaking occur when a property is occupied, it is not surprising that housebreaking is rated amongst the crimes that cause people most concern and worry. However basic measures to improve the physical security of dwellings, including robust specification of doors, windows, glazing and locks, can act deter the opportunist thief.

Guidance to other standards is also relevant to promoting a more secure environment, as follows:

- lighting of common entrances and *dwelling* entrances (standard 4.1);
- lighting within the common areas of *domestic* buildings and access control systems to common entrances (standard 4.6);
- ensuring security measures do not adversely affect means of escape (standard 2.9).

Further advice

‘Secured by Design’ is the established police initiative to design out elements within development that may contribute to housebreaking and other crimes. ‘Secured by Design’ accreditation considers *site* design and layout as well as physical security measures and offers a more comprehensive solution than those physical provisions set out within this standard. As ‘Secured by Design’ is assessed on a *site*-specific basis, the police can also offer recommendations on appropriate additional measures in areas where the risk of crimes, such as housebreaking, are considered greater. Information on the scheme can be found online at www.securedbydesign.com

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirement of this standard (regulation 12, schedule 6).

4.13.1 Physical security of doors and windows

The two most common means of unlawful entry into a *dwelling* are through doors or windows, where these are either left open or can be easily forced open. The level of security of any *dwelling* can be significantly enhanced by ensuring that all external doors and any windows or glazing in vulnerable locations are manufactured and installed to resist forced entry and also that unauthorised entry into common areas is prevented.

Doors should be designed and installed to resist forced entry at:

- an external door to a *dwelling* or common area of a *domestic building*; and
- an entrance or egress door to a *flat* or *maisonette*; and
- a door between a *dwelling* and a *conservatory* or garage.

Windows

Windows and glazing should be designed and installed to resist forced entry where:

- located at ground floor level and easily accessible; or
- where otherwise easily accessible from outside, such as by climbing on *building* projections.

There are a number of ways in which this can be achieved:

- a. by meeting the recommendations for physical security in Section 2 of '[Secured by Design](#)' (ACPO, 2009); or
- b. by use of doorsets and windows which are tested and certified by a *notified body* as meeting a recognised standard for security; or
- c. by use of doorsets and windows manufactured to meet recognised product standards and defined component performance.

The baseline recommendations in (c) are relevant to all such doors and windows.

4.13.2 Doors and windows – 'Secured by Design'

'Secured by Design' (ACPO, 2009) offers a comprehensive solution to the security of dwellings, addressing *site* design and layout as well as detailed physical security measures. It is particularly relevant to new build or building conversions involving multiple units.

A door or window in the locations described in clause 4.13.1 should meet the recommendations for physical security in Section 2 of '[Secured by Design](#)'. Information on Secured by Design and its application can be found online at www.securedbydesign.com

4.13.3 Doors and windows – product accreditation

A door or window in the locations described in clause 4.13.1 should be tested and certified by a *notified body* as meeting a recognised standard for security such as PAS 24: 2007 for doorsets or BS 7950: 1997 for windows.

4.13.4 Doors and windows – product standards and component performance

To ensure a robust, basic standard of security, a doorset or window in the locations described in clause 4.13.1 should be designed and constructed in accordance with the general recommendations of the product standard appropriate for the material used, such as:

- BS 7412: 2007, for PVCu units;
- BS 644: 2009, for timber window units;
- BS 4873: 2009, for aluminium alloy units;
- BS 6510: 2005, for steel-framed units.

Vulnerable windows should be constructed to resist attempts to force frames and, if openable, ironmongery. Windows which can be opened should be fitted with either:

- a keyed locking system that uses a removable key; or
- a keyless locking system, together with glazing which incorporates laminated glass or a similarly robust glazing material.

Where a material standard for a doorset is not available, it should be designed and constructed in accordance with the recommendations in Annex A of BS 8220-1: 2000, together with the following recommendations, to ensure a robust basic standard of security.

Hinges	If single swing the doorset should be fitted with at least one and a half pairs of hinges meeting the recommendations of BS EN 1935: 2002 for hinge grade 11 or above. Hinges fitted to an outward-opening door should be of a type that does not permit the hinge pin to be removed unless the door is open. Otherwise, hinge bolts should be fitted to ensure the door leaf will remain secure when closed.
Locking	<p>A doorset should include a single-point locking device to BS 3621: 2007 (for keyed egress) or to BS 8621: 2007 (for keyless egress) or a multipoint locking system. A deadlocking facility should be provided. Any lock cylinder should be in accordance with BS EN 1303: 2005, grade 5 key security and grade 2 attack resistance as a minimum.</p> <p>To limit unauthorised access, a communal entrance door fitted with an access control system (see clause 4.63) should be self-closing and self-locking, with keyless operation of any lock from within the common area. To accommodate access control systems, a doorset may incorporate electronic or magnetic remote release and a means of access which includes keyless electronic solutions (keypad, proximity swipe, etc).</p>
Glazing	Access to door locks from outside by breaking of glazing, in or adjacent to a door leaf should be prevented by use of laminated glass or a similarly robust glazing material.
Sliding doors	A sliding door should have a multi-point deadlocking system with 3 or more hook or similar bolts. To prevent removal of the door, an anti-lift device should be fitted. Shoot bolts, if used, should locate into the head of the frame.

Double doors

A doorset with more than one door leaf should include a means of securing any secondary leaf at head and foot to allow the primary leaf to be securely locked.

4.13.5 Installation and fixing of doors and windows

Inadequate fixing into the surrounding structure will significantly affect the security performance of a doorset or window. In most cases, fixings designed to resist normal anticipated loads, such as from wind and accidental impact, will also ensure that a doorset or window is secure against the more common basic methods of forced entry.

To ensure a robust installation, fixing of a doorset or window should be in accordance with:

- the recommendations given in section 8 of BS 8213-4: 2007; or
- manufacturer's written instructions where these meet or exceed the recommendation within this British Standard.